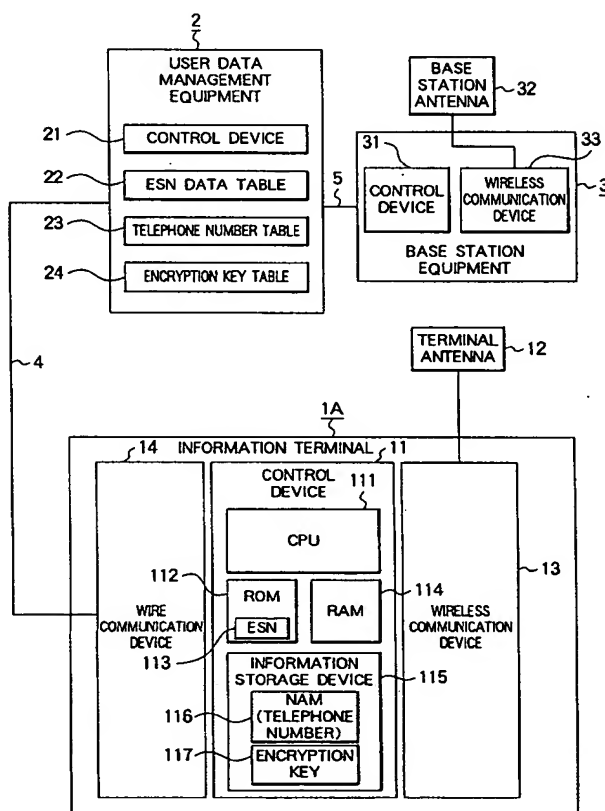




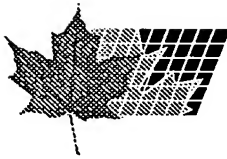
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(54) **TERMINAL D'INFORMATIONS**
(54) **INFORMATION TERMINAL**



(57) TRANSLATION NOT AVAILABLE AT THIS TIME

(57) With known information terminals, the method of inputting the telephone number or like information directly from a keyboard on the terminal does not require a specialized writing implement but there have been problems with this method such as input errors occurring easily and the time consuming process of inputting all





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items. The information terminal relating to the present invention includes a wire communication device which obtains a telephone number for wireless telephone communication via wire lines from management equipment which manages users, a control device which stores the aforementioned telephone number for wireless telephone communication, and a wireless communication device which conducts wireless communication using the aforementioned telephone number for wireless telephone communication, wherein registration of information such as the telephone number, encryption key, and the like can be conducted in a speedy and sure manner without necessitating human intervention. Also, there is little danger of the encryption key falling into other hands upon registration thereof, since the encryption key does not pass through a third party such as a dealer.

ABSTRACT

With known information terminals, the method of inputting the telephone number or like information directly from a keyboard on the terminal does not require a specialized writing implement but there have been problems with this method such as input errors occurring easily and the time consuming process of inputting all items. The information terminal relating to the present invention includes a wire communication device which obtains a telephone number for wireless telephone communication via wire lines from management equipment which manages users, a control device which stores the aforementioned telephone number for wireless telephone communication, and a wireless communication device which conducts wireless communication using the aforementioned telephone number for wireless telephone communication, wherein registration of information such as the telephone number, encryption key, and the like can be conducted in a speedy and sure manner without necessitating human intervention. Also, there is little danger of the encryption key falling into other hands upon registration thereof, since the encryption key does not pass through a third party such as a dealer.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. An information terminal comprising:

a wire communication device which obtains information pertaining to wireless communication via wire lines from management equipment which manages users;

a control device which stores said information pertaining to wireless communication; and

a wireless communication device which conducts wireless communication using said information pertaining to wireless communication.

2. An information terminal according to Claim 1;

wherein said information pertaining to wireless communication comprises a telephone number.

3. An information terminal according to Claim 2;

wherein said control device controls said wire communication device so as to notify said management equipment of ESN via said wire line, and so as to obtain a telephone number for wireless telephone assigned by said management equipment, and further to store said obtained telephone number for wireless telephone in an information storage device within said control device;

and wherein said wireless communication device conducts wireless communication using said stored telephone number for wireless communication.

4. An information terminal according to Claim 1;
wherein said information pertaining to wireless communication comprises an IP address.

5. An information terminal according to Claim 4;
wherein said control device controls said wire communication device so as to notify said management equipment of ESN via said wire line, and so as to obtain an IP address assigned by said management equipment, and further to store said obtained IP address in an information storage device within said control device;
and wherein said wireless communication device conducts wireless communication using said stored IP address.

6. An information terminal according to Claim 1;
wherein said information pertaining to wireless communication comprises a wireless communication control program.

7. An information terminal according to Claim 6;
wherein said control device controls said wire communication device so as to notify said management

equipment of new wireless communication control program request via said wire line, and so as to obtain a new wireless communication control program from said management equipment, said wireless communication control program being stored therein, and further to store said obtained new wireless communication control program in an information storage device within said control device;

and wherein said wireless communication device conducts wireless communication using said stored new wireless communication control program.

8. An information terminal according to Claim 1;

wherein said information pertaining to wireless communication comprises an encryption key.

9. An information terminal according to Claim 8;

wherein said control device conducts changing of encryption key by using a certain algorithm for generating a first code based on a first ESN, a first telephone number and a first encryption key stored within an information storage device within said control device, and controls said wire communication device so as to notify said management equipment of encryption key change request and to send said first ESN, said first telephone number and said first code via said wire line,

said management equipment using an algorithm which is the same as said certain algorithm for generating a second code based on a second ESN, a second telephone number and a second encryption key, said second numbers corresponding to said first ESN and said first telephone number, following which said second code and said first code are compared, and in the event that said codes correspond, said control device obtains from said management equipment via said wire line the new encryption key generated based on said second ESN;

and wherein said wireless communication device conducts wireless communication using said obtained new encryption key.

10. An information terminal comprising:

a wire communication device which obtains information pertaining to wireless communication via wire lines from management equipment which manages users;

a control device which stores and processes said information pertaining to wireless communication; and

a wireless communication device which conducts wireless communication.

11. An information terminal according to Claim 10;

wherein said information pertaining to wireless communication comprises communication history lists.

12. An information terminal according to Claim 11;

wherein said control device controls said wire communication device upon inspecting communication history list so as to notify said management equipment of parameters unique to said terminal via said wire line, and so as to obtain a first communication history list corresponding with said parameters unique to said terminal from said management equipment via said wire line, and further to compare said a communication history list stored in an information storage device within said control device with said first communication history list.

13. An information terminal according to Claim 10;

wherein said information pertaining to wireless communication comprises wireless call charges.

14. An information terminal according to Claim 13;

wherein said control device controls said wire communication device upon inspecting wireless call charges so as to notify said management equipment of parameters unique to said terminal via said wire line, and so as to obtain a first wireless call charges corresponding with said parameters unique to said terminal from said management equipment via said wire line, and further to compare second wireless call charges stored in an information storage device within said control device with said first wireless call charges.

INFORMATION TERMINAL

The present invention relates to an information terminal for wire communication functions, and for wireless communication functions such as cellular telephones, mobile telephones, wireless packet communications, or the like, within a single terminal.

Description of an information terminal according to the prior art will now be made with reference to Fig. 26. In 10 Figure 26, the wireless communication system comprises an information terminal 1, user data management equipment 2, base station equipment 3, wireless telephone office 6, and dealer or equipment supplier 7. The user data management equipment 2 and multiple base station equipment 3 are connected by a dedicated line 5, although Figure 26 only shows one base station equipment location.

Also, in Figure 26, the aforementioned information terminal 1 comprises a control device 11, a terminal antenna 12, and a wireless communication device 13 complying with 20 cellular telephone standards or CDPD (Cellular Digital Packet Data) standards.

Further, in the Figure, the aforementioned control device 11 comprises a CPU 111, ROM 112, RAM 114, and an information storage device 115. Also, an ESN (Electronic Serial Number) 113, which is a serial number unique to the terminal, is stored within the ROM 112. The information

storage device 115 is a memory device such as EEPROM, flash ROM, battery-backed-up RAM, or the like which maintains memory even in the event that the power is turned off. With cellular telephones such as AMPS (Advanced Mobil Phone Service), the aforementioned information storage device 115 stores a NAM (Number Assignment Module), telephone numbers 116, an encryption key 117, and the like.

Further yet, in the Figure, the aforementioned user data management equipment 2 comprises a control device 21 which includes a CPU or the like, an ESN data table 22 which includes terminal data of a plurality of users, a telephone number table 23, an encryption key table 24, and controls for each of the tables. Also, the aforementioned tables are situated on a large-capacity hard disk device (HDD).

Moreover, in the Figure, the aforementioned base station equipment 3 comprises a control device 31 which includes a CPU or the like, a base station antenna 32, and wireless communication equipment 33.

With the known information terminal (including cellular telephones and mobile telephones) 1, application to the wireless telephone office (operator) 6 and registration must be conducted at the time of purchase in order to make the information terminal actually usable. First, the serial number ESN 113 which is unique to the user terminal is reported to the wireless telephone office 6, following which the wireless telephone office 6 assigns a NAM telephone

number to that terminal and notifies the user thereof, as well as registering the ESN and telephone number in the user data management equipment 2. The user inputs the NAM telephone number to his / her own terminal, and only then does the terminal becomes usable.

In other words, registration of the ESN and telephone number must be conducted by the two parties: the wireless telephone office 6; and the user. Also, registration of an encryption key becomes necessary as well, in the event that
10 the user desires such. This key is used in wireless communication to determine whether the connection request is from a legitimate user or not. In practice, a dealer 7 often performs the user-side registration.

With known cellular telephones and mobile telephones, there are two ways by which the NAM telephone number is registered to the user's terminal: the user inputting directly from a keyboard on the terminal; and by the dealer 7 using a specialized writing device. While the method of inputting directly from a keyboard on the terminal does not
20 require a specialized device there are problems with this method such as input errors and the time involved in inputting all items. Particularly, the encryption key 117 for AMPS and D-AMPS (Dual AMPS) systems has up to 26 digits, and is not suitable for input from a keyboard.

Although it is preferable that the encryption key be changed periodically, considering the consequences of the

encryption key falling in other hands, it is not very practical for a user to input an encryption key up to 26 digits in length from a keyboard on the terminal. Also, when changing the encryption key with the known system, registration must again be made with the wireless telephone office (operator) 6.

Further, with the known system, in order to confirm whether the telephone number, ESN, or encryption key of one's information terminal 1 has not been stolen and used
10 without authorization one would have the wireless telephone office 6 send communications records compiled by the wireless telephone office 6 such as communication history wireless communication bills, or the like, and the user would then compare these records one with another to confirm the contents thereof and thus judge whether or not the telephone number, ESN, or encryption key is being used without authorization. However, there are limits to the extent that all of the communication records can be checked by human means, and thus unauthorized usage of stolen ESNs
20 and telephone numbers for communication is a perpetual problem.

Further, in cases where alterations need to be made in the control program in the wireless information terminal, such as cases where the control program in the wireless information terminal is faulty and the program must be corrected, or in cases where the user desires to upgrade the

program to a higher version to correspond with new functions, the known system necessitates temporary collection of the terminal for writing to be conducted by means of a specialized device. This has resulted in increased costs for collection, investment costs for the writing device and labor costs for writing.

While the method of inputting directly from a keyboard on an information terminal such as described above does not require a specialized writing device there are problems with this method such as the likelihood of input errors and the process being time consuming.

In the event that the user has a dealer to conduct the writing of the telephone number, etc., a specialized writing implement is often employed for this, but there are problems with this, such as that the dealer needs a computer for writing and a specialized adapter, resulting in substantial facility investment in order to install such equipment in all dealer locations. Also, in this case, a third party becomes involved in the encryption key writing process, thus creating the possibility that the information of the encryption key may fall into other hands.

Further, there are problems with the known system, in that in order to confirm whether the telephone number, ESN, or encryption key of one's information terminal has not been stolen and used without authorization one would need to have the wireless telephone office send communications lists

compiled by the wireless telephone office (operator), and the user would then compare these lists one with another to confirm the contents thereof and thus judge whether or not the telephone number, ESN, or encryption key is being used without authorization. However, there are limits to the extent all of the communication records can be checked by human means, and thus unauthorized usage of stolen ESNs and telephone numbers for communication has been a perpetual problem.

10

SUMMARY OF THE INVENTION

Accordingly, the present invention has been made in view of the above-described problems, and it is an object thereof to provide an information terminal wherein registration of the ESN to the telephone office and registration of the telephone number, NAM, and encryption key to the terminal can be conducted in a speedy and sure manner without necessitating human intervention.

Also, the present invention has been made in view of
20 the above-described problems, and it is another object thereof to provide an information terminal wherein information respecting the encryption key does not fall into other hands upon conducting the process of registration of the encryption key.

Further, the present invention has been made in view of the above-described problems, and it is another object

thereof to provide an information terminal wherein alteration of the control program thereof and upgrading the control program thereof to a higher or later version can be conducted easily without human intervention.

Further yet, the present invention has been made in view of the above-described problems, and it is another object thereof to provide an information terminal wherein the encryption key can be changed in an easy and sure manner so that unauthorized use thereof can be prevented even in
10 the event that the encryption key does fall into other hands.

Moreover, the present invention has been made in view of the above-described problems, and it is another object thereof to provide an information terminal wherein the user can discover whether or not one's terminal number or ESN is being used by another individual.

The information terminal relating to the present invention comprises: a wire communication device which obtains information pertaining to wireless communication via
20 wire lines from management equipment which manages users; a control device which stores the aforementioned information pertaining to wireless communication; and a wireless communication device which conducts wireless communication using the aforementioned information pertaining to wireless communication.

Also, the information terminal relating to the present invention is such wherein the aforementioned information pertaining to wireless communication comprises a telephone number.

Further, the information terminal relating to the present invention is such wherein the aforementioned control device controls the aforementioned wire communication device so as to notify the aforementioned management equipment of ESN via the aforementioned wire line, and so as to obtain a
10 telephone number for wireless telephone assigned by the aforementioned management equipment, and further to store the aforementioned obtained telephone number for wireless telephone in an information storage device within the aforementioned control device, and wherein the aforementioned wireless communication device conducts wireless communication using the aforementioned stored telephone number for wireless communication.

Also, the information terminal relating to the present invention is such wherein the aforementioned information
20 pertaining to wireless communication comprises an IP address.

Further, the information terminal relating to the present invention is such wherein the aforementioned control device controls the aforementioned wire communication device so as to notify the aforementioned management equipment of ESN via the aforementioned wire line, and so as to obtain an

IP address assigned by the aforementioned management equipment, and further to store the aforementioned obtained IP address in an information storage device within the aforementioned control device, and wherein the aforementioned wireless communication device conducts wireless communication using the aforementioned stored IP address.

Also, the information terminal relating to the present invention is such wherein the aforementioned information
10 pertaining to wireless communication comprises a wireless communication control program.

Further, the information terminal relating to the present invention is such wherein the aforementioned control device controls the aforementioned wire communication device so as to notify the aforementioned management equipment of a new wireless communication control program request via the aforementioned wire line, and so as to obtain a new wireless communication control program from the aforementioned management equipment, the aforementioned wireless
20 communication control program being stored therein, and further to store the aforementioned obtained new wireless communication control program in an information storage device within the aforementioned control device, and wherein the aforementioned wireless communication device conducts wireless communication using the aforementioned stored new wireless communication control program.

Also, the information terminal relating to the present invention is such wherein the aforementioned information pertaining to wireless communication comprises an encryption key.

Further, the information terminal relating to the present invention is such wherein the aforementioned control device changes the encryption key by using a certain algorithm for generating a first code based on a first ESN, a first telephone number and a first encryption key stored
10 within an information storage device within the aforementioned control device, and controls the aforementioned wire communication device so as to notify the aforementioned management equipment of an encryption key change request and to send the aforementioned first ESN, the aforementioned first telephone number and the aforementioned first code via the aforementioned wire line, the aforementioned management equipment using an algorithm which is the same as the aforementioned certain algorithm for generating a second code based on a second ESN, a second
20 telephone number and a second encryption key, the aforementioned second numbers corresponding to the aforementioned first ESN and the aforementioned first telephone number, following which the aforementioned second code and the aforementioned first code are compared, and in the event that the aforementioned codes correspond, the aforementioned control device obtains from the

aforementioned management equipment via the aforementioned wire line the new encryption key generated based on the aforementioned second ESN, and wherein the aforementioned wireless communication device conducts wireless communication using the aforementioned obtained new encryption key.

Moreover, the information terminal relating to the present invention comprises: a wire communication device which obtains information pertaining to wireless
10 communication via wire lines from management equipment which manages users; a control device which stores and processes the aforementioned information pertaining to wireless communication; and a wireless communication device which conducts wireless communication.

Also, the information terminal relating to the present invention is such wherein the aforementioned information pertaining to wireless communication comprises communication lists.

Also, the information terminal relating to the present
20 invention is such wherein the aforementioned control device controls the aforementioned wire communication device upon inspecting communication lists so as to notify the aforementioned management equipment of parameters unique to the aforementioned terminal via the aforementioned wire line, and so as to obtain a first communication list corresponding with the aforementioned parameters unique to

the aforementioned terminal from the aforementioned management equipment via the aforementioned wire line, and further to compare a second communication list stored in an information storage device within the aforementioned control device with the aforementioned first communication list.

Also, the information terminal relating to the present invention is such wherein the aforementioned information pertaining to wireless communication comprises wireless call charges.

10 Further, the information terminal relating to the present invention is such wherein the aforementioned control device controls the aforementioned wire communication device upon inspecting wireless call charges so as to notify the aforementioned management equipment of parameters unique to the aforementioned terminal via the aforementioned wire line, and so as to obtain first wireless call charges corresponding with the aforementioned parameters unique to the aforementioned terminal from the aforementioned management equipment via the aforementioned wire line, and
20 further to compare second wireless call charges stored in an information storage device within the aforementioned control device with the aforementioned first wireless call charges.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram illustrating the configuration of a first embodiment according to the present invention;

Fig. 2 is a diagram illustrating the operation sequence of a first embodiment according to the present invention;

Fig. 3 is a flowchart illustrating the operation of a first embodiment according to the present invention;

10 Fig. 4 is a flowchart illustrating the operation of user data management equipment relating to a first embodiment according to the present invention;

Fig. 5 is a block diagram illustrating the configuration of a second embodiment according to the present invention;

Fig. 6 is a diagram illustrating the operation sequence of a second embodiment according to the present invention;

Fig. 7 is a flowchart illustrating the operation of a second embodiment according to the present invention;

20 Fig. 8 is a flowchart illustrating the operation of user data management equipment relating to a second embodiment according to the present invention;

Fig. 9 is a block diagram illustrating the configuration of a third embodiment according to the present invention;

Fig. 10 is a diagram illustrating the operation sequence of a third embodiment according to the present invention;

Fig. 11 is a flowchart illustrating the operation of a third embodiment according to the present invention;

Fig. 12 is a flowchart illustrating the operation of user data management equipment relating to a third embodiment according to the present invention;

Fig. 13 is a block diagram illustrating the configuration of a fourth embodiment according to the present invention;

Fig. 14 is a diagram illustrating the operation sequence of a fourth embodiment according to the present invention;

Fig. 15 is a diagram for describing the code generating algorithm of a fourth embodiment according to the present invention;

Fig. 16 is a flowchart illustrating the operation of a fourth embodiment according to the present invention;

Fig. 17 is a flowchart illustrating the operation of user data management equipment relating to a fourth embodiment according to the present invention;

Fig. 18 is a block diagram illustrating the configuration of a fifth embodiment according to the present invention;

Fig. 19 is a diagram illustrating the operation sequence of a fifth embodiment according to the present invention;

Fig. 20 is a flowchart illustrating the operation of a fifth embodiment according to the present invention;

Fig. 21 is a flowchart illustrating the operation of user data management equipment relating to a fifth embodiment according to the present invention;

Fig. 22 is a block diagram illustrating the configuration of a sixth embodiment according to the present invention;

Fig. 23 is a diagram illustrating the operation sequence of a sixth embodiment according to the present invention;

Fig. 24 is a flowchart illustrating the operation of a sixth embodiment according to the present invention;

Fig. 25 is a flowchart illustrating the operation of user data management equipment relating to a sixth embodiment according to the present invention; and

Fig. 26 is a block diagram illustrating the configuration of a wireless communication system including a privately known but unpublished information terminal.

First Embodiment

Description of the first embodiment according to the present invention will be made with reference to Figs. 1 through 4. Fig. 1 is a block diagram illustrating the configuration of the first embodiment according to the present invention. Fig. 2 is a diagram illustrating the operation sequence of the first embodiment according to the present invention. Fig. 3 and Fig. 4 are flowcharts illustrating the operation of the first embodiment according to the present invention. In the Figures, identical reference numerals or reference characters represent identical or equivalent items.

10

In Fig. 1, the wireless communication system comprises an information terminal 1A, user data management equipment 2, and base station equipment 3. The information terminal 1A and user data management equipment 2 are connected by a public wire line 4. The user data management equipment 2 and multiple locations of base station equipment 3 are connected by a dedicated line 5, although Figure 1 only shows one base station equipment location.

20

Also, in Figure 1, the aforementioned information terminal 1A comprises a control device 11, a terminal antenna 12, a wireless communication device 13 complying with cellular telephone standards such as AMPS (Advanced Mobil Phone Service), D-AMPS (Dual AMPS), CDMA (Code

Division Multiple Access), PDC (Personal Digital Cellular), or the like, and a wire communication device 14.

Further, in the Figure, the aforementioned control device 11 comprises a CPU 111, ROM 112, RAM 114, and an information storage device 115. Also, an ESN (Electronic Serial Number) 113, which is a serial number unique to the terminal, is stored within the ROM 112. The information storage device 115 is a memory device such as EEPROM, flash ROM, battery-backed-up RAM, or the like which maintains
10 memory even in the event that the power is turned off. With cellular telephones such as AMPS, the aforementioned information storage device 115 stores a NAM (Number Assignment Module), telephone number 116, and an encryption key 117 which is used for wireless line connection confirmation. The ESN 113 which serves as a serial number unique to the terminal may also be stored in the information storage device 115.

Further yet, in the Figure, the aforementioned user data management equipment 2 comprises a control device 21
20 which includes a CPU or the like, an ESN data table 22 which contains terminal data of a plurality of users, a telephone number table 23, and encryption key table 24, control device 21 controls each of the tables. Also, the aforementioned tables are situated on a large-capacity hard disk device (HDD). Also, the user data management equipment 2 is equipment which manages the ESN and telephone number of

wireless telephone users, and judges whether requests for outgoing or incoming calls made by the information terminal 1A are connection requests by a legitimate user or not.

Moreover, in the Figure, the aforementioned base station equipment 3 comprises a control device 31 which includes a CPU or the like, a base station antenna 32, and wireless communication equipment 33. The aforementioned base station equipment 3 is base station equipment for cellular telephone, such as AMPS, D-AMPS, CDMA, or the like.

10 The aforementioned NAM 116 is part of the parameters unique to the terminal which are necessary for wireless communication, such as a telephone number, and the like. The telephone number for wireless telephone of the AMPS system is equivalent to this NAM 116.

First, at the time of purchase of the information terminal 1A by the user, the NAM (telephone number) is not registered in the information storage device 115 within the information terminal 1A. Wireless communication can not be made in this state, since the telephone number for wireless
20 telephone (NAM) is not registered within the terminal. The following is a description of the registration procedures of the NAM (telephone number) according to this first embodiment.

In this state, the control device 11 of the information terminal 1A controls the wire communication device 14 so as to connect to the user data management equipment 2 via

public wire line 4, and issues a line connection request (Steps 130 through 131 of Figure 3). Subsequently, the control device 11 of the information terminal 1A reads out the ESN information from the ROM 112 within the control device 11, and sends the ESN information of the terminal to which it belongs, and at the same time, also sends a telephone number assignment request (Steps 132 through 134 of Figure 3). In the event that the ESN information is stored in the information storage device 115, the control
10 device 11 reads out the ESN information from the information storage device 115. Also, in the event that the information terminal 1A has no other function, sending of the ESN information means requesting of telephone number assignment, and there is no need to conduct a separate operation of sending a telephone number assignment request.

On the other hand, upon receiving the line connection request and telephone number assignment request from the information terminal 1A, the user data management equipment 2 waits for reception of the ESN, and upon reception of
20 such, conducts telephone number assignment (Steps 200 through 203 Figure 4). The user data management equipment 2 also adds the sent ESN data to the ESN data table 22. Further, after the line connection request, the user data management equipment 2 performs any other requests that may be made (Steps 207 through 208 Figure 4).

In other words, the user data management equipment 2 assigns a NAM (telephone number for wireless telephone) for the information terminal corresponding with the ESN thereof, and adds the NAM to the telephone number table 23. The user data management equipment 2 also generates an encryption key which is stored in the encryption key table 24, and sends the encryption key along with the assigned telephone number for wireless telephone to the information terminal 1A via the public wire line 4 (Steps 204 through 206 Figure 4).

10 In the event that the user desires that an information terminal which does not have encryption key-related functions be handled, the above-described encryption key process is unnecessary. Thus, the registration of the information terminal 1A at the user data management equipment 2 is completed.

Next, upon reception of the NAM (telephone number for wireless telephone) 116 and encryption key 117 via the public wire line 4, the information terminal 1A stores these in the information storage device 115 within the control
20 device 11, and subsequently conducts wireless telephone communication using the aforementioned telephone number for wireless telephone and encryption key (Steps 135 through 136 Figure 3). In the case of an information terminal which does not have encryption key-related functions, wireless telephone communication are conducted using only the

telephone number for wireless telephone without an encryption key.

According to the information terminal 1A relating to the first embodiment, registration of the NAM (telephone number) 116 and encryption key 117 are conducted directly with the user data management equipment 2 via the public wire line 4, so that there is no need for the user to register the NAM (telephone number for wireless telephone) via a terminal keyboard, consequently specialized writing
10 implements are unnecessary. Moreover, there is little danger of the encryption key falling into other hands upon registration thereof, since the encryption key does not pass through a third party.

Second Embodiment

Description of a second embodiment according to the present invention will be made with reference to Figs. 5 through 8. Fig. 5 is a block diagram illustrating the configuration of the second embodiment according to the
20 present invention. Fig. 6 is a diagram illustrating the operation sequence of the second embodiment according to the present invention. Fig. 7 and Fig. 8 are flowcharts illustrating the operation of the second embodiment according to the present invention.

In Fig. 5, the wireless communication system comprises an information terminal 1B, user data management equipment 2, and a CDPD base station 3A. The information terminal 1B and user data management equipment 2 are connected by a public wire line 4. The user data management equipment 2 and multiple CDPD base stations 3A are connected by a dedicated line 5, although the Figure only shows one CDPD base station 3A.

Also, in the Figure, the aforementioned information
10 terminal 1B comprises a control device 11, a terminal antenna 12, a CDPD standards packet communication device 13A, and a wire communication device 14.

Further, in the Figure, the aforementioned control device 11 comprises a CPU 111, ROM 112, RAM 114, and an information storage device 115. Also, an ESN 113 which is a serial number unique to the terminal is stored within the ROM 112. The information storage device 115 is a memory device such as EEPROM, flash ROM, battery-backed-up RAM, or the like which maintains memory even in the event that the
20 power is turned off. The aforementioned information storage device 115 stores an NEI (Network Entity Identifier), IP (Internet Protocol) address 118, and an encryption key 117 which is used for wireless line connection confirmation.

Further yet, in the Figure, the aforementioned user data management equipment 2 comprises a control device 21 which includes a CPU or the like, an ESN data table 22 which

contains terminal data of a plurality of users, an IP address table 25, and an encryption key table 24. The aforementioned tables are situated in a large-capacity hard disk device (HDD). Moreover, the user data management equipment 2 manages the ESN and IP addresses of wireless telephone users, and determines whether requests for outgoing or incoming calls made by the information terminal 1B are connection requests by a legitimate user. It also manages usage charges according to the transmission and
10 reception of packets to and from this information terminal 1B, as well as managing the ESN and NEI (IP address) of the information terminal 1B of the user.

Moreover, in the Figure, the aforementioned CDPD base station 3A comprises a control device 31 which includes a CPU or the like, a base station antenna 32, and wireless communication equipment 33.

At the time of purchase of the information terminal 1B by the user, the NEI (IP address) 118 is not registered in the information storage device 115 within the information
20 terminal 1B, and CDPD wireless communication can not be effected.

In this condition, the control device 11 of the information terminal 1B controls the wire communication device 14 so as to connect to the user data management equipment 2 via public wire line 4, and issues a line connection request (Steps 140 through 141 Figure 7).

Subsequently, the control device 11 of the information terminal 1B reads out the ESN information from the ROM 112 within the control device 11, and sends the ESN information of the terminal to which it belongs, and at the same time, also sends an IP address assignment request (Steps 142 through 144 Figure 7). In the event that the ESN information is stored in the information storage device 115, the control device 11 reads out the ESN information from the information storage device 115. Also, in the event that the information terminal 1B has no other function, sending of the ESN information means requesting of IP address assignment, and there is no need to conduct a separate operation of sending an IP address assignment request.

On the other hand, upon receiving the line connection request and IP address assignment request from the information terminal 1B, the user data management equipment 2 waits for reception of the ESN, and upon reception of such, conducts IP address assignment (Steps 210 through 213). The user data management equipment 2 also adds the sent ESN data to the ESN data table 22. Further, after the line connection request, the user data management equipment 2 performs any other requests that may be made (Steps 217 through 218 Figure 8).

In other words, the user data management equipment 2 assigns an NEI (IP address) for the information terminal corresponding to the ESN thereof, and adds the IP address to

the IP address table 25. The user data management equipment 2 also generates an encryption key which is stored in the encryption key table 24, and sends the encryption key along with the assigned IP address to the information terminal 1B via the public wire line 4 (Steps 214 through 216 Figure 8).

If the information terminal does not have encryption key-related functions, the above-described encryption key process is unnecessary. Thus, the registration of the information terminal 1B at the user data management
10 equipment 2 is completed.

Next, upon reception of the NEI (IP address) and encryption key via the public wire line 4, the information terminal 1B stores these in the information storage device 115 within the control device 11, and subsequently conducts CDPD communication using the aforementioned NEI (IP address) and encryption key (Steps 145 through 146 Figure 7). In the case of an information terminal which does not have encryption key-related functions, CDPD communication is conducted using only the NEI (IP address) without an
20 encryption key.

According to the information terminal 1B relating to the second embodiment, the IP address, which is a parameter relating to wireless communication and which is unique to the terminal, is obtained directly from the user data management equipment 2 via the public wire line 4. This information is stored in the information storage device 115

of the control device 11 within the information terminal 1B, so that registration of the ESN to the user data management equipment 2 and registration of the NEI (IP address) and encryption key to the information terminal 1B is conducted without involving a third party, and in a speedy and secure manner. Moreover, there is little danger of the encryption key falling into other hands upon registration thereof, since the encryption key does not pass through a third party such as a dealer.

10

Third Embodiment

Description of a third embodiment according to the present invention will be made with reference to Figs. 9 through 12. Fig. 9 is a block diagram illustrating the configuration of the third embodiment according to the present invention. Fig. 10 is a diagram illustrating the operating sequence of the third embodiment according to the present invention. Fig. 11 and Fig. 12 are flowcharts illustrating the operation of the third embodiment according to the present invention.

20

In Fig. 9, the wireless communication system comprises an information terminal 1C, a computer 2A, and base station equipment 3. The information terminal 1C and computer 2A are connected by a public wire line 4. The computer 2A and multiple locations of base station equipment 3 are connected

by a dedicated line 5, although the Figure only shows one base station equipment location.

Also, in the Figure, the aforementioned information terminal 1C comprises a control device 11, a terminal antenna 12, a wireless communication device 13 which complies with cellular telephone standards such as AMPS, D-AMPS, CDMA, PDC, or the like, and a wire communication device 14.

Further, in the Figure, the aforementioned control
10 device 11 comprises a CPU 111, ROM 112, RAM 114, and an information storage device 115. The information storage device 115 is a memory device, such as EEPROM, flash ROM, battery-backed-up RAM, or the like, which maintains memory even in the event that the power is turned off, and stores an old wireless communication control program 119 or the like.

Further, in the Figure, the aforementioned computer 2A
is a computer of the type which performs maintenance of a wireless communication terminal, or a wireless telephone
20 office. The computer 2A comprises a control device 21 including a CPU or the like, and a new communication control program 26.

Moreover, in the Figure, the aforementioned base station equipment 3 comprises a control device 31 which includes a CPU or the like, a base station antenna 32, and wireless communication equipment 33.

There may be situations wherein the old wireless communication control program 119 within the information terminal 1C requires alteration. Situations where alterations are necessary include: cases where problems are discovered in the terminal software; cases where the software needs to be changed to correspond with the functionality of a new wireless communications system; cases where the version of the communications software installed in the wireless communications device 13 is to be upgraded; 10 cases where the encryption algorithm has been deciphered by another party and must be changed; or the like.

The control device 11 of the information terminal 1C controls the wire communication device 14 so as to connect to the computer 2A of the maintenance company or the like via public wire line 4, and issues a line connection request (Steps 150 through 151 Figure 11). Subsequently, the control device 11 of the information terminal 1C sends a new wireless communications control program request (Step 152 Figure 11).

20 On the other hand, upon receiving the line connection request and a new wireless communications control program request from the information terminal 1C, the computer 2A sends the new wireless communications control program stored therein to the information terminal 1C (Steps 220 through 222 Figure 12). Further, after the line connection request,

the computer 2A performs any other requests that may be made (Steps 223 through 224 Figure 12).

Next, upon reception of the new wireless communications control program via the public wire line 4, the information terminal 1C stores this in the information storage device 115 within the control device 11, i.e., conducts over-writing of the wireless communications control program, and subsequently conducts wireless communication using the aforementioned new wireless communications control program
10 26 (Steps 153 through 154 Figure 11).

According to the information terminal 1C relating to the third embodiment, the new control program 26 relating to wireless communication is obtained directly from the user data management equipment 2 via the public wire line 4, and this new control program 26 is stored in the information storage device 115, so that alteration of the wireless communications control program can be conducted easily and in a secure manner.

20 Fourth Embodiment

Description of the fourth embodiment according to the present invention will be made with reference to Figs. 13 through 17. Fig. 13 is a block diagram illustrating the configuration of the fourth embodiment according to the present invention. Fig. 14 is a diagram illustrating the operation sequence of the fourth embodiment according to the

present invention. Fig. 15 is a diagram for describing the code generating algorithm of the fourth embodiment according to the present invention. Fig. 16 and Fig. 17 are flowcharts illustrating the operation of the fourth embodiment according to the present invention.

In Fig. 13, the wireless communication system comprises an information terminal 1D, user data management equipment 2, and base station equipment 3. The information terminal 1D and user data management equipment 2 are connected by a public wire line 4. The user data management equipment 2 and multiple locations of base station equipment 3 are connected by a dedicated line 5, although the Figure only shows one base station equipment location.

Also, in the Figure, the aforementioned information terminal 1D comprises a control device 11, a terminal antenna 12, a wireless communication device 13 complying with cellular telephone standards such as AMPS, D-AMPS, CDMA, PDC, or the like, and a wire communication device 14.

Further, in the Figure, the aforementioned control device 11 comprises a CPU 111, ROM 112, RAM 114, and an information storage device 115. Also, an ESN -A 121 which is a serial number unique to the terminal is stored within the ROM 112. The information storage device 115 is a memory device such as EEPROM, flash ROM, battery-backed-up RAM, or the like, which maintains memory even in the event that the power is turned off, and stores a telephone number -A 122

and an encryption key -A 123. The ESN -A 121 which serves as a serial number unique to the terminal may also be stored in the information storage device 115.

Further yet, in the Figure, the aforementioned user data management equipment 2 comprises a control device 21 which includes a CPU or the like, an ESN data table 22 which contains terminal data of a plurality of users, a telephone number table 23, and encryption key table 24, and controls each of the tables. Also, the aforementioned tables are
10 situated in a large-capacity hard disk device (HDD). Also, the user data management equipment 2 is equipment which manages the ESN and telephone number of wireless telephone users, and determines whether requests for outgoing or incoming calls made by the information terminal 1D are connection requests by a legitimate user.

Moreover, in the Figure, the aforementioned base station equipment 3 comprises a control device 31 which includes a CPU or the like, a base station antenna 32, and wireless communication equipment 33.

20 In Figs. 13 and 14, the ESN, telephone number, and encryption key registered within the information terminal 1D are denoted by ESN -A 121, telephone number -A 122, and encryption key -A 123, respectively. Also, the ESN, telephone number, and encryption key registered within the user data management equipment 2 are denoted by ESN -B 27, telephone number -B 28, and encryption key -B 29,

respectively. In Figures 13 and 14, the information terminal 1D is in a state where wireless telephone communication is available.

In this state, when the user judges that the ESN -A 121, telephone number -A 122, or encryption key -A 123 of his / her own terminal may be being used without authorization by another party, the user uses the control device 11 of the information terminal 1D to control the wire communication device 14 so as to connect to the user data management equipment 2 via public wire line 4, and issue a line connection request (Steps 160 through 161 Figure 16). Subsequently, a code A 120 is generated using a certain algorithm, based on the ESN -B 121, telephone number -B 122, and encryption key -B 123 (Step 162 Figure 16).

Now, description of the certain algorithm for generating the code A 120 will be described with reference to Fig. 15. Fig. 15 is a diagram for describing the code generating algorithm of the fourth embodiment according to the present invention.

Fig. 15 shows an example of generating an 8-byte code in the case where the ESN is 4 bytes long, the telephone number is 3 bytes long, and the encryption key is 8 bytes long. i.e., as shown in the Figure, the 4 bytes of the ESN are first used as the higher 4 bytes, then the next 3 bytes are comprised of the telephone number, and the lowest byte

is comprised of a "0", thus creating an 8-byte intermediate code.

Next, the exclusive logical sum (EX-OR) of this 8-byte intermediate code and the 8-byte encryption key is obtained, thus generating an 8-byte code.

An encryption key alteration request is then sent, and the ESN -B 121, telephone number -B 122, and generated code A are sent to the user data management equipment 2 (Steps 163 through 164 Figure 16). The old encryption key -A 123
10 is not sent.

On the other hand, upon receiving the line connection request and encryption key alteration request from the information terminal 1D, the user data management equipment 2 waits for reception of the ESN -B 121, telephone number -B 122, and generated code A, and upon reception of such, conducts generation of a code B (Steps 230 through 233 Figure 17). Further, after the line connection request, the user data management equipment 2 performs any other requests that may be made (Steps 237 through 238 Figure 17).

20 In other words, the user data management equipment 2 searches the ESN data table 22 and telephone number table 23 stored within for the ESN -B 27 and telephone number -B 28 corresponding to the ESN -A 121 and telephone number -A 122 that have been sent, and also searches the encryption key table 24 for the encryption key -B 29 stored therein, and thus generates a code B 30 using the same algorithm as the

information terminal 1D based on the ESN -B 27, telephone number -B 28, and encryption key -B 29.

Next, the user data management equipment 2 compares the code A 120 sent from the information terminal 1D with the internally generated code B 30. If the codes match, judgment is made that the encryption key alteration request is from a legitimate user (Step 234). On the other hand, if the codes do not match, access from the information terminal 1D is denied.

10 If the user data management equipment 2 determines that the encryption key alteration request is from a legitimate user, the user data management equipment 2 generates a new encryption key from the ESN, stores the new encryption key in the encryption key table 24, and sends the new encryption key (Step 235 through 236 Figure 17). i.e., the user data management equipment 2 replaces the old encryption key -B 29 with the new encryption key, and sends the information terminal 1D the new encryption key via public wire line 4.

20 Next, upon reception of the new encryption key via the public wire line 4, the information terminal 1D stores this in the information storage device 115 within the control device 11, i.e., conducts replacement of the old encryption key -A 123 with the new encryption key, and subsequently conducts wireless communication using the aforementioned new encryption key (Steps 165 through 166 Figure 16).

According to the information terminal 1D relating to the fourth embodiment, the encryption key used for wireless line connection is obtained via the public wire line 4. This encryption key is stored in the information storage device 115, and wireless line connection confirmation (authorization) is made using this stored encryption key. As well, wire line connection confirmation (authorization) is made using this stored encryption key, thus performing altering of the encryption key, via public wire line 4, so
10 that alteration of the encryption key can be conducted easily.

Fifth Embodiment

Description of the fifth embodiment according to the present invention will be made with reference to Figs. 18 through 21. Fig. 18 is a block diagram illustrating the configuration of the fifth embodiment according to the present invention. Fig. 19 is a diagram illustrating the operation sequence of the fifth embodiment according to the
20 present invention. Fig. 20 and Fig. 21 are flowcharts illustrating the operation of the fifth embodiment according to the present invention.

In Fig. 18, the wireless communication system comprises an information terminal 1E, user data management equipment 2B, and base station equipment 3. The information terminal 1E and user data management equipment 2B are connected by a

public wire line 4. The user data management equipment 2B and multiple locations of base station equipment 3 are connected by a dedicated line 5, although the Figure only shows one base station equipment location.

Also, in the Figure, the aforementioned information terminal 1E comprises a control device 11, a terminal antenna 12, a wireless communication device 13 complying with cellular telephone standards such as AMPS, D-AMPS, CDMA, PDC, or the like, and a wire communication device 14.

10 Further, in the Figure, the aforementioned control device 11 comprises a CPU 111, ROM 112, RAM 114, and an information storage device 115. Also, an ESN 113 which is a serial number unique to the terminal is stored within the ROM 112. The information storage device 115 is a memory device such as EEPROM, flash ROM, battery-backed-up RAM, or the like, which maintains memory even in the event that the power is turned off, and stores a NAM (telephone number) 116, an encryption key 117, communication histories B 124, and the like. The ESN 113 which serves as a serial number
20 unique to the terminal may also be stored in the information storage device 115.

Further yet, in the Figure, the aforementioned user data management equipment 2B comprises a control device 21 which includes a CPU or the like, and a communication histories table 40 stored in a hard disk device (HDD) or the like.

Moreover, in the Figure, the aforementioned base station equipment 3 comprises a control device 31 which includes a CPU or the like, a base station antenna 32, and wireless communication equipment 33.

In Figs. 18 and 19, in the event that a connection request from the information terminal 1E to the base station equipment 3 (outgoing call) or a connection request from the base station equipment 3 to the information terminal 1E (incoming call) occurs, the communication history thereof is
10 stored in the communication history list A 41 within the communication history table 40 in the user data management equipment 2B.

This aforementioned communication history list A is comprised of the telephone number of the other party (regardless of whether the call was made from the information device to the other party or vice versa), the date and time of the call, the duration of the call, etc. This communication history list A is managed by the ESN or telephone number. The information terminal 1E also stores a
20 wireless communication history list in the information storage device 115 within the information terminal 1E in the form of communication history lists B 124. The contents of this communication history list B are the same as those of the aforementioned communication history list A.

The control device 11 within the information terminal 1E accesses the user data management equipment 2B via the

public wire line 4 either periodically or on demand by the user, and obtains the communication history list A compiled by the base station equipment 3 and user data management equipment 2B.

More specifically, the control device 11 of the information terminal 1E controls the wire communication device 14 so as to connect to the user data management equipment 2B via public wire line 4, and issues a line connection request (Steps 170 through 171 Figure 20).

10 Subsequently, the control device 11 of the information terminal 1E reads out the ESN information 113 from the ROM 112 within the control device 11, and sends the ESN information of the terminal to which it belongs, and at the same time, also sends a communication history list request (Steps 172 through 174 Figure 20). In the event that the ESN information is stored in the information storage device 115, the control device 11 reads out the ESN information from the information storage device 115. Also, in the event that the information terminal 1E has no other function,
20 sending of the ESN information means requesting of communication histories, and there is no need to conduct a separate operation of sending a communication history list request.

On the other hand, upon receiving the line connection request and communication history request from the information terminal 1E, the user data management equipment

2B waits for reception of the ESN, and upon reception of such, conducts a search of the corresponding communication history (Steps 240 through 243 Figure 21). Further, after the line connection request, the user data management equipment 2B performs any other requests that may be made (Steps 245 through 246 Figure 21).

In other words, the user data management equipment 2B searches the communication history A (telephone number of other party, date and time of call, duration of call, etc.)

10 41 corresponding with the sent ESN from the communication history table 40, and sends the communication history list A to the information terminal 1E via the public wire line 4 (Steps 243 through 244 Figure 21).

Next, upon reception of the communication A 41 sent via public wire line 4, the control device 11 within the information terminal 1E compares this communication history list A 41 with the communication history list B 124 stored within the information storage device 115 (Steps 175 through 176 Figure 20). If these match, one can thus know that the

20 ESN, telephone number (NAM), or encryption key of one's information terminal have not been stolen and used without authorization on another information terminal. On the other hand, if the comparison shows that the communication history list A 41 contains a call which is not in the communication history list B 124, there is the possibility that another party may have stolen and be using the ESN, telephone number

(NAM), or encryption key thereof. The local telephone number (NAM) may be sent to the user data management equipment 2B via the public wire line 4 instead of sending the ESN, so as to obtain the communication history list A 41.

According to this fifth embodiment, a wireless communication history list A unique to the terminal which has been compiled by the base station is obtained via public wire line 4, and a wireless communication history list B 10 compiled within the terminal itself is stored therein. Comparison is made between the wireless communication list A unique to the terminal which has been compiled by the base station and wireless communication list B compiled within the terminal itself, thus allowing for discovery of whether or not one's terminal number or ESN is being used without authorization by another party.

Sixth Embodiment

Description of the sixth embodiment according to the 20 present invention will be made with reference to Figs. 22 through 25. Fig. 22 is a block diagram illustrating the configuration of the sixth embodiment according to the present invention. Fig. 23 is a diagram illustrating the operation sequence of the sixth embodiment according to the present invention. Fig. 24 and Fig. 25 are flowcharts

illustrating the operation of the sixth embodiment according to the present invention.

In Fig. 22, the wireless communication system comprises an information terminal 1F, user data management equipment 2C, and base station equipment 3. The information terminal 1F and user data management equipment 2C are connected by a public wire line 4. The user data management equipment 2C and multiple locations of base station equipment 3 are connected by a dedicated line 5, although the Figure only
10 shows one base station equipment location.

Also, in the Figure, the aforementioned information terminal 1F comprises a control device 11, a terminal antenna 12, a wireless communication device 13 complying with cellular telephone standards such as AMPS, D-AMPS, CDMA, PDC, or the like, and a wire communication device 14.

Further, in the Figure, the aforementioned control device 11 comprises a CPU 111, ROM 112, RAM 114, and an information storage device 115. Also, an ESN 113 which is a serial number unique to the terminal is stored within the
20 ROM 112. The information storage device 115 is a memory device such as EEPROM, flash ROM, battery-backed-up RAM, or the like, which maintains memory even in the event that the power is turned off, and stores a NAM (telephone number) 116, an encryption key 117, wireless call charges B 125, and the like. The ESN 113 which serves as a serial number

unique to the terminal may also be stored in the information storage device 115.

Further yet, in the Figure, the aforementioned user data management equipment 2C comprises a control device 21 which includes a CPU or the like, and a wireless call charges table 42 stored on a large-capacity hard disk device (HDD) or the like.

Moreover, in the Figure, the aforementioned base station equipment 3 comprises a control device 31 which
10 includes a CPU or the like, a base station antenna 32, and wireless communication equipment 33.

In Figs. 22 and 23, in the event that a connection request from the information terminal 1F to the base station equipment 3 (outgoing call) or a connection request from the base station equipment 3 to the information terminal 1F (incoming call) occurs, the wireless call charges thereof are stored in the wireless call charges A 43 within the wireless call charges table 42 in the user data management equipment 2C. The information terminal 1F also stores
20 wireless call charges in the information storage device 115 within the information terminal 1F in the form of wireless call charges B 125. The contents of the wireless call charges A 43 and the wireless call charges B 125 are added up each time a call is made.

The control device 11 within the information terminal 1F accesses the user data management equipment 2C via the

public wire line 4 either periodically or on demand by the user, and obtains the wireless call charges A 43 compiled by the base station equipment 3 and user data management equipment 2C.

More specifically, the control device 11 of the information terminal 1F controls the wire communication device 14 so as to connect to the user data management equipment 2C via public wire line 4, and issues a line connection request (Steps 180 through 181 Figure 24).

- 10 Subsequently, the control device 11 of the information terminal 1F reads out the ESN information 113 from the ROM 112 within the control device 11, and sends the ESN information of the terminal to which it belongs, and at the same time, also sends a wireless call charges request (Steps 182 through 184 Figure 24). In the event that the ESN information is stored in the information storage device 115, the control device 11 reads out the ESN information from the information storage device 115. Also, in the event that the information terminal 1F has no other function, sending of
- 20 the ESN information means requesting of wireless call charges, and there is no need to conduct a separate operation of sending a wireless call charges request.

On the other hand, upon receiving the line connection request and wireless call charges request from the information terminal 1F, the user data management equipment 2C waits for reception of the ESN, and upon reception of

such, conducts searching of the corresponding wireless call charges (Steps 250 through 253 Figure 25). Further, after the line connection request, the user data management equipment 2C performs any other requests that may be made (Steps 255 through 256 Figure 25).

In other words, the user data management equipment 2C searches the wireless call charges A 43 corresponding with the sent ESN from the wireless call charges table 42, and sends the wireless call charges A 43 to the information
10 terminal 1F via the public wire line 4 (Steps 253 through 254 Figure 25).

Next, upon reception of the wireless call charges A 43 sent via public wire line 4, the control device 11 within the information terminal 1F compares the wireless call charges A 43 with the wireless call charges B 125 stored within the information storage device 115 (Steps 185 through 186 Figure 24). If these match approximately, one can thus know that the ESN, telephone number (NAM), or encryption key of one's information terminal have not been stolen and used
20 without authorization on another information terminal. On the other hand, if the comparison shows that the wireless call charges A 43 are considerably higher than the wireless call charges B 125, there is the possibility that another party may have stolen and be using the ESN, telephone number (NAM), or encryption key thereof. The local telephone number (NAM) may be sent to the user data management

equipment 2C via the public wire line 4 instead of sending the ESN, so as to obtain the wireless call charges A 43.

According to this sixth embodiment, wireless call charges A unique to the terminal which has been compiled by the base station are obtained via public wire line 4, wireless call charges B compiled within the terminal itself are stored therein, and comparison is made between the wireless call charges A unique to the terminal which has been compiled by the base station and wireless call charges B compiled within the terminal itself, thus allowing for discovery of whether or not the one's terminal number or ESN is being used unauthorized by another party.

FIG. 1

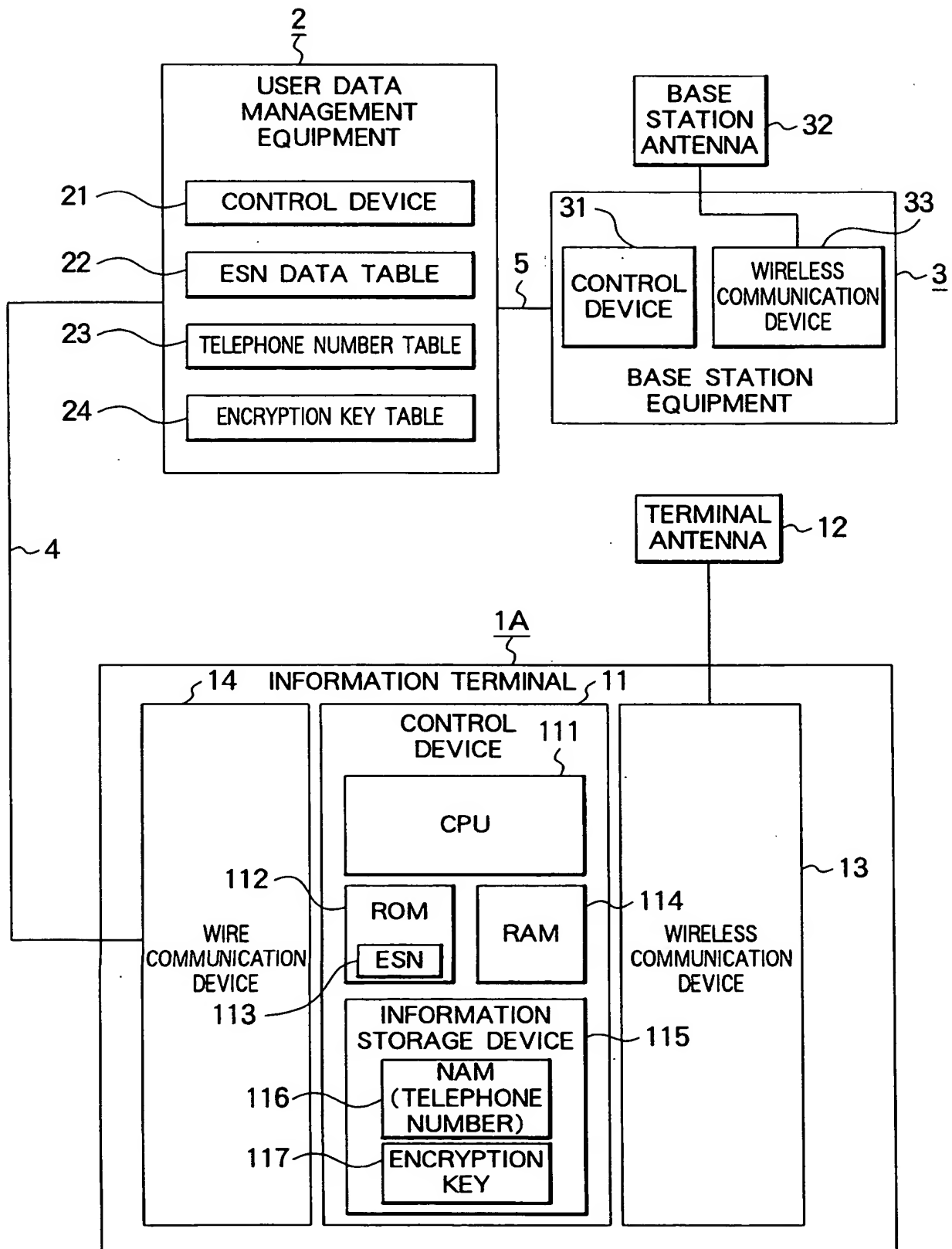


FIG. 2

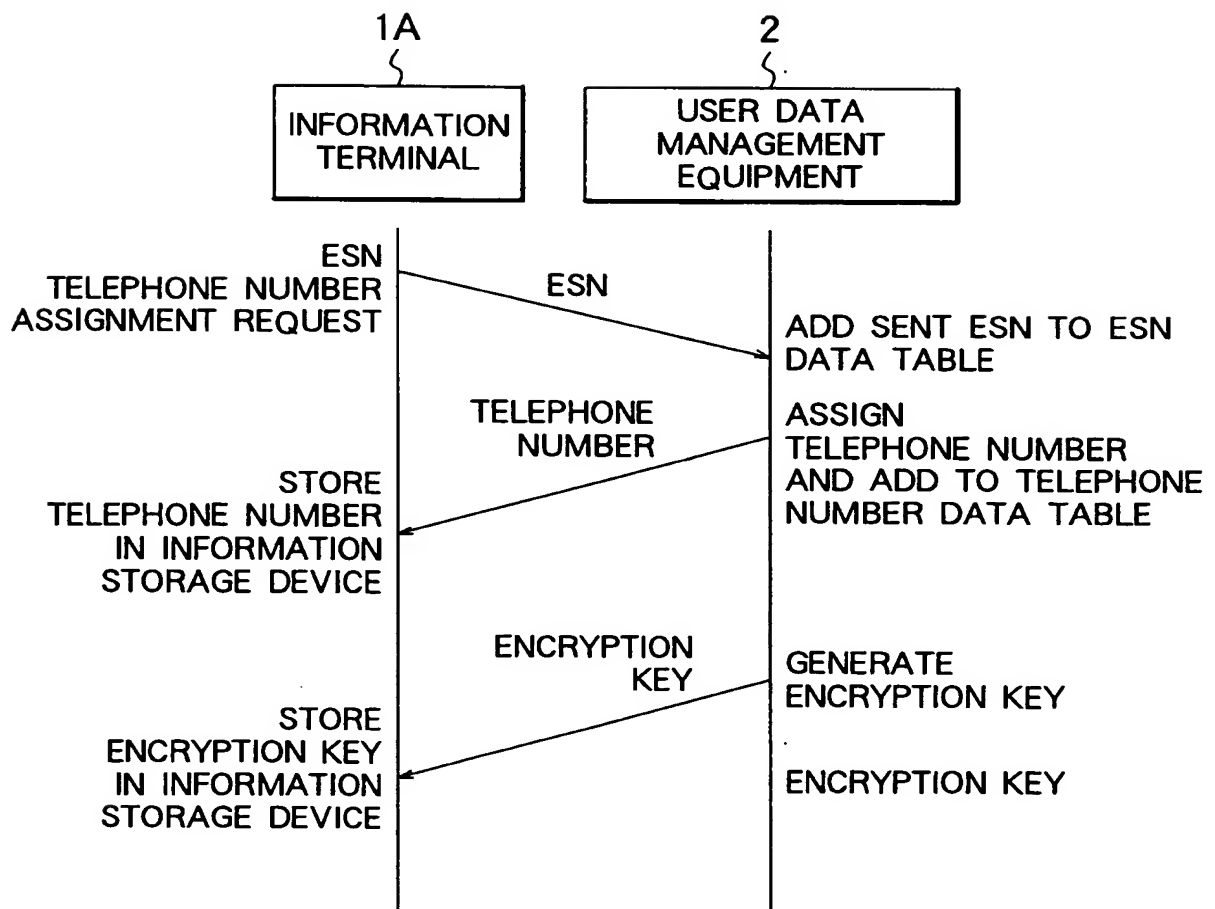


FIG. 3

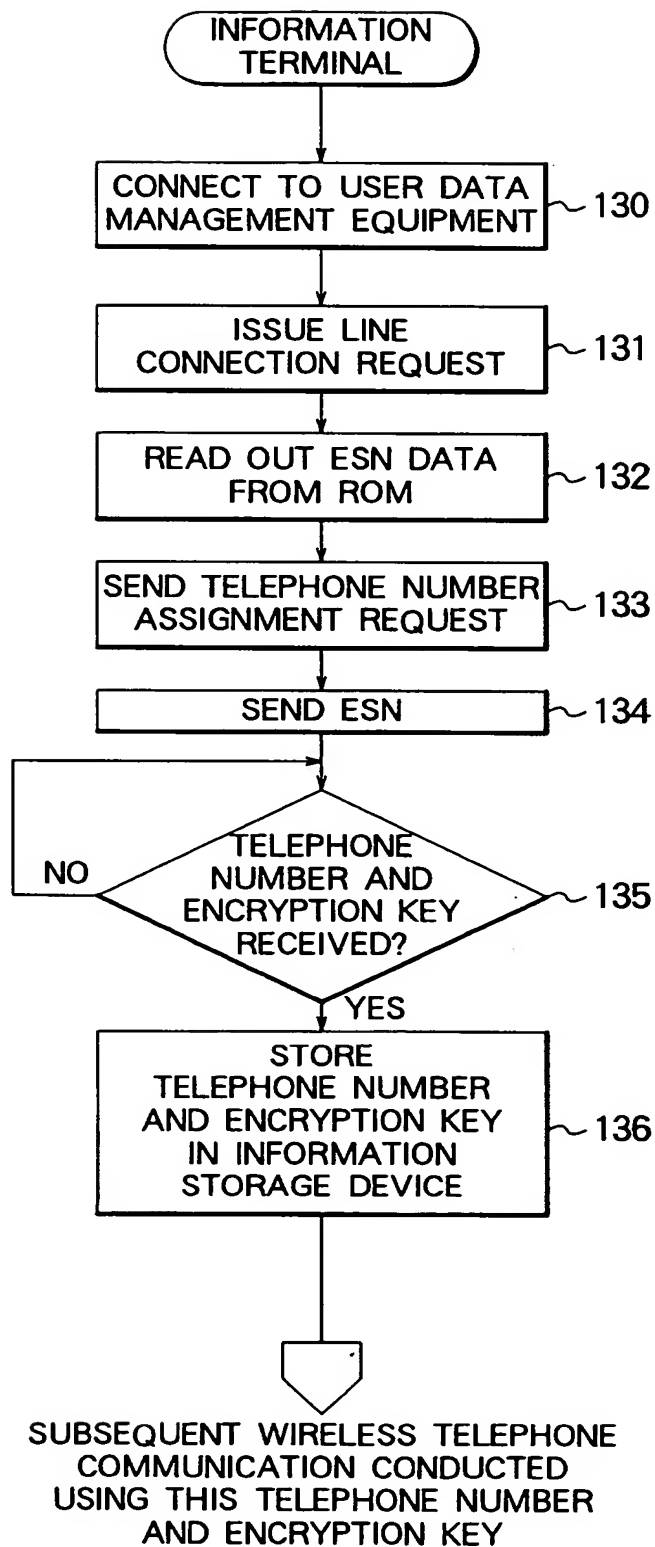


FIG. 4

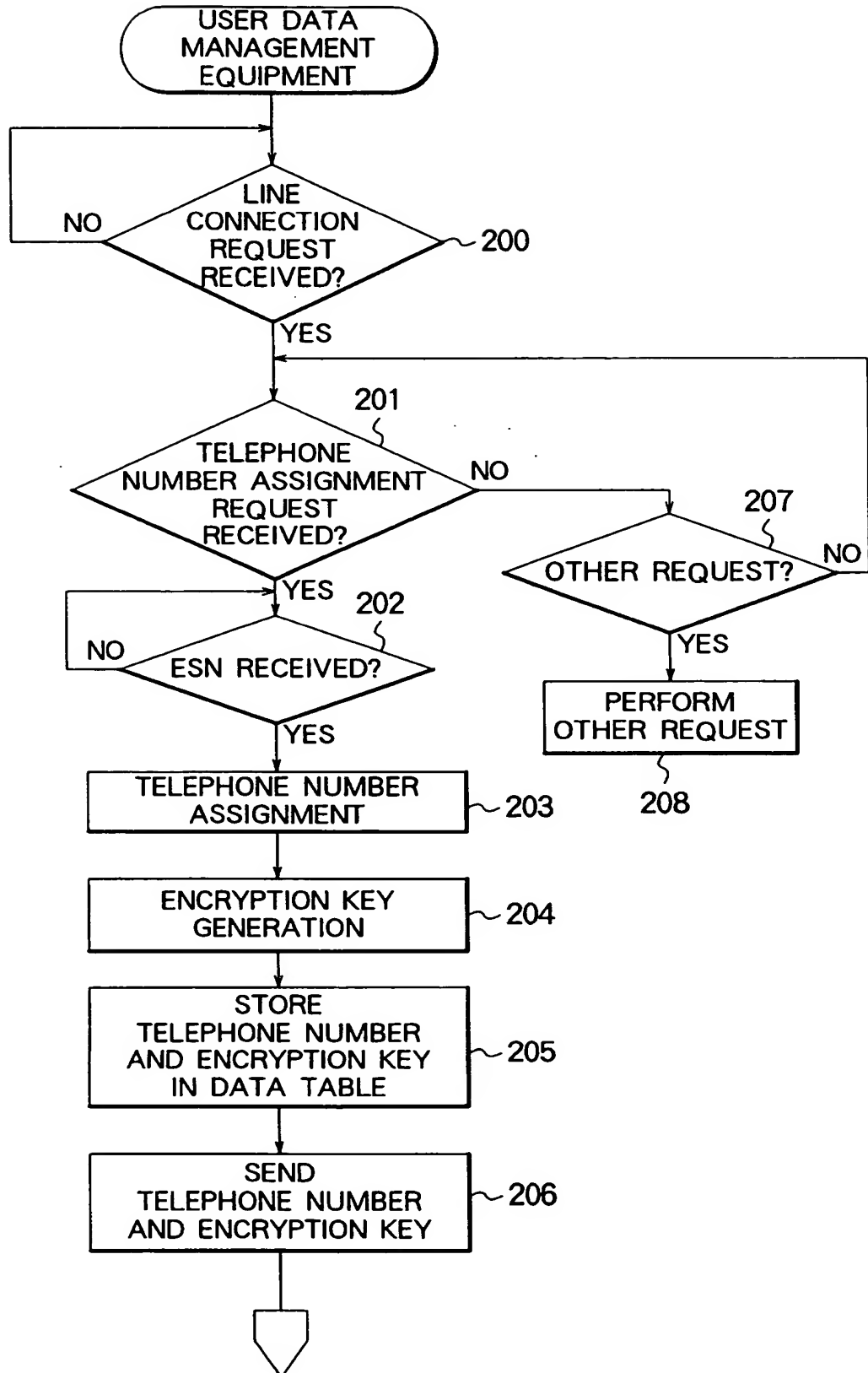


FIG. 5

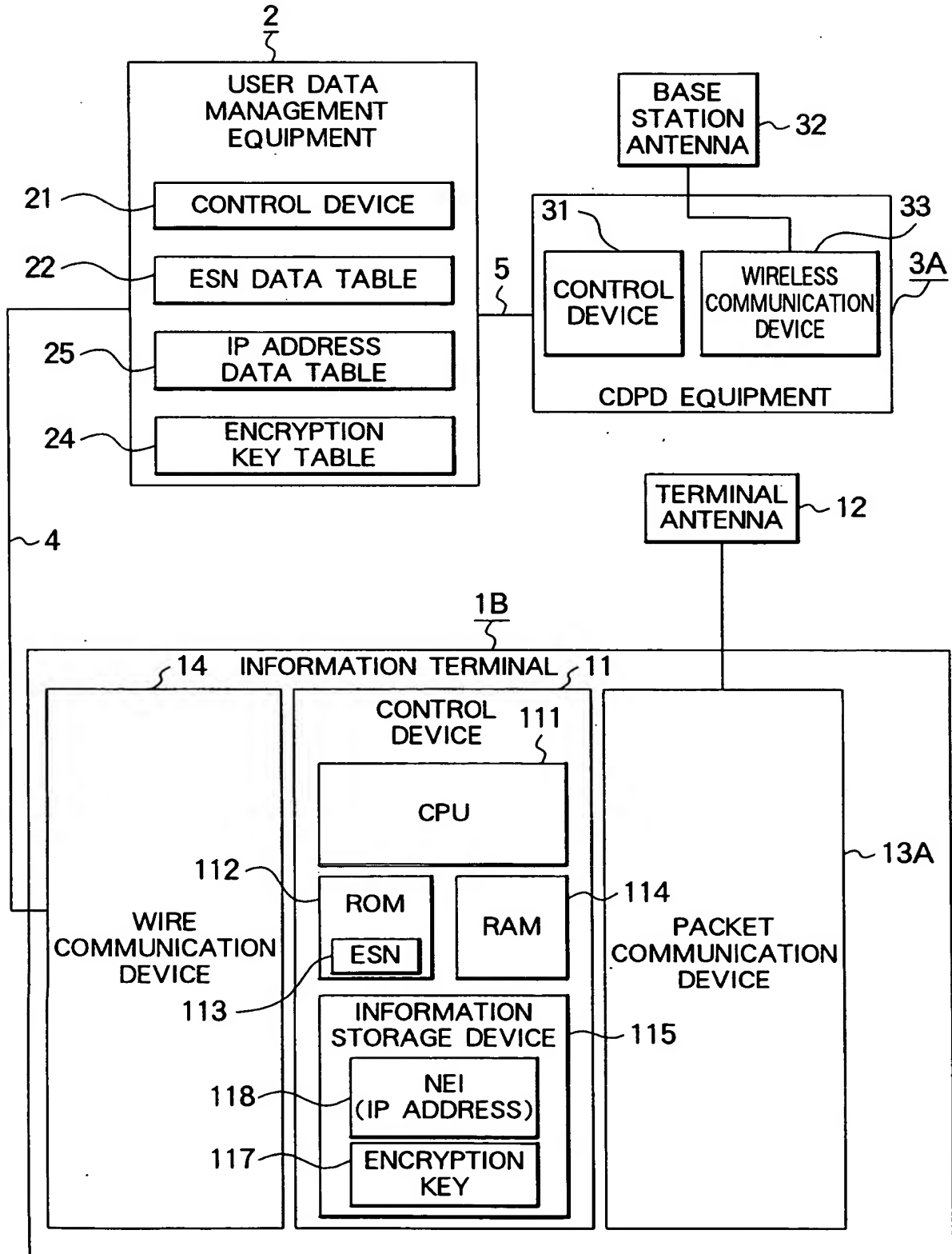


FIG. 6

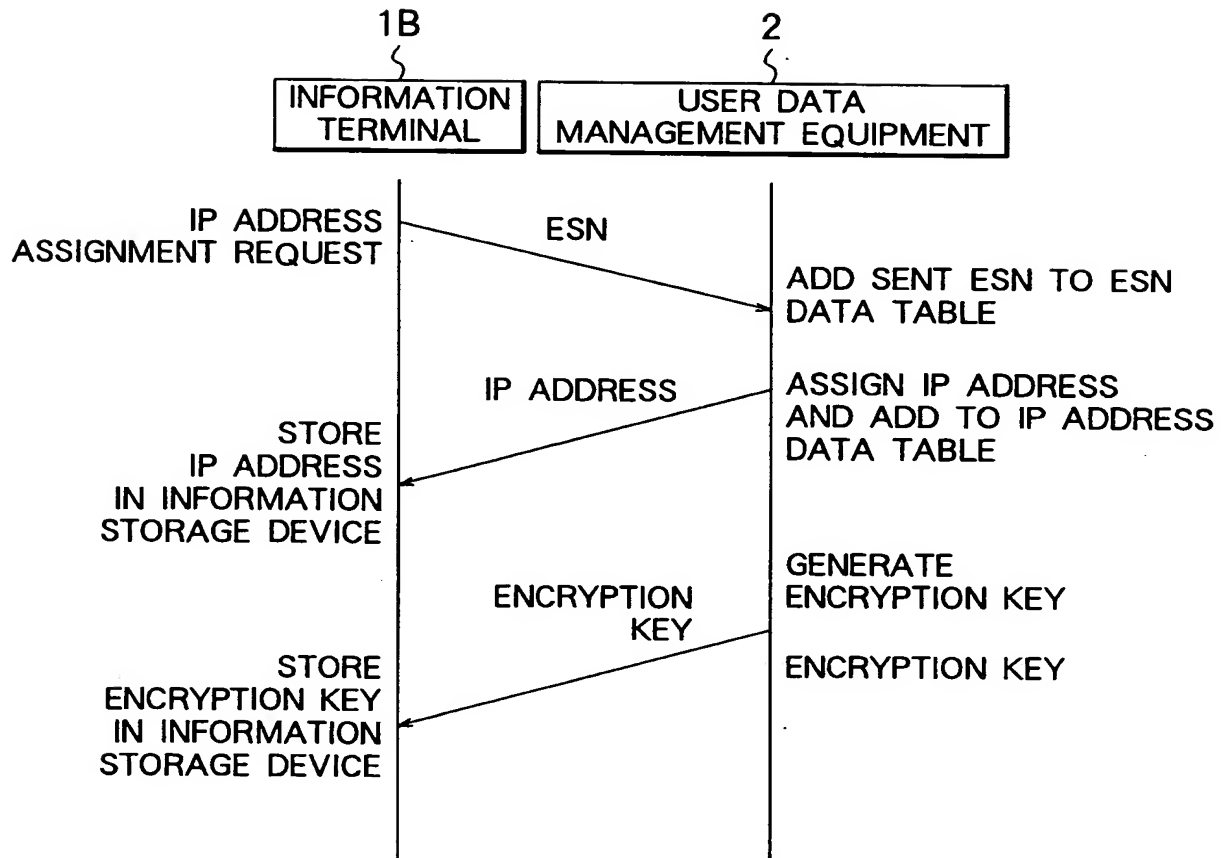


FIG. 7

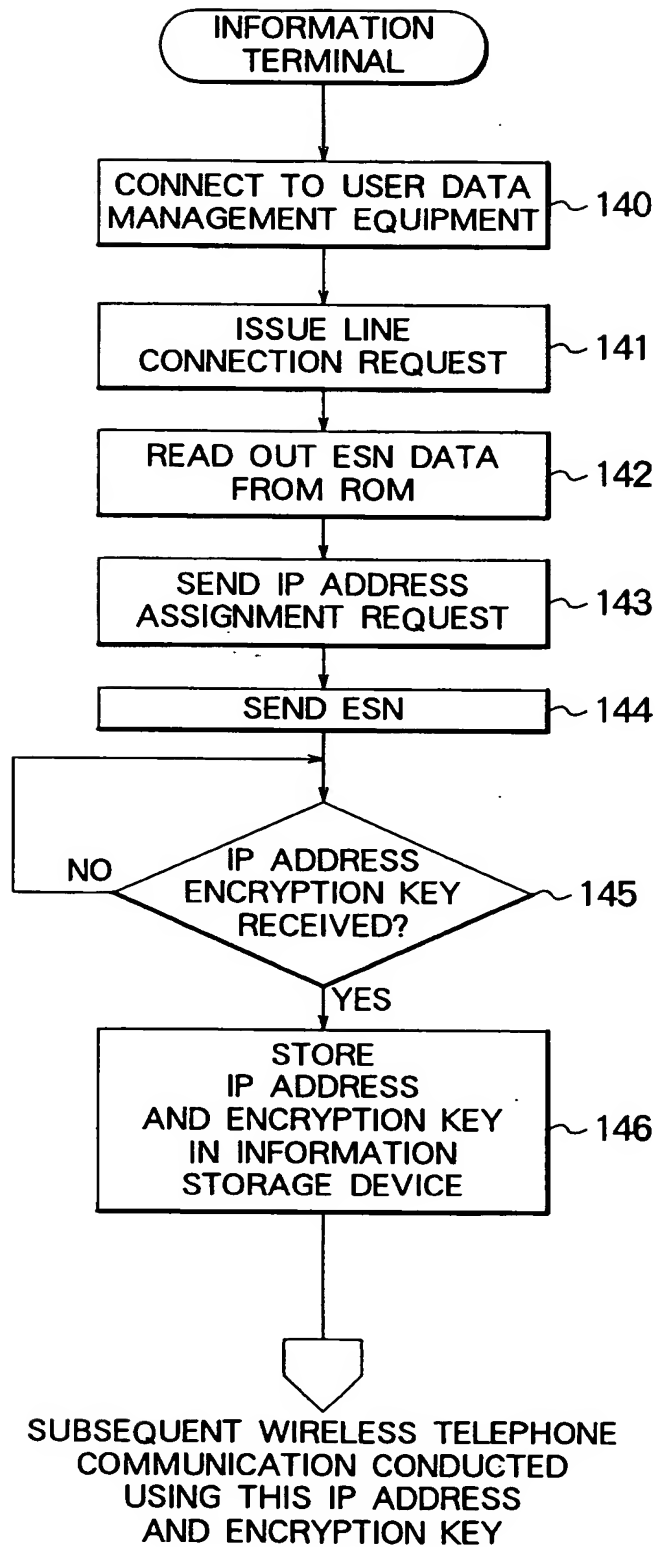


FIG. 8

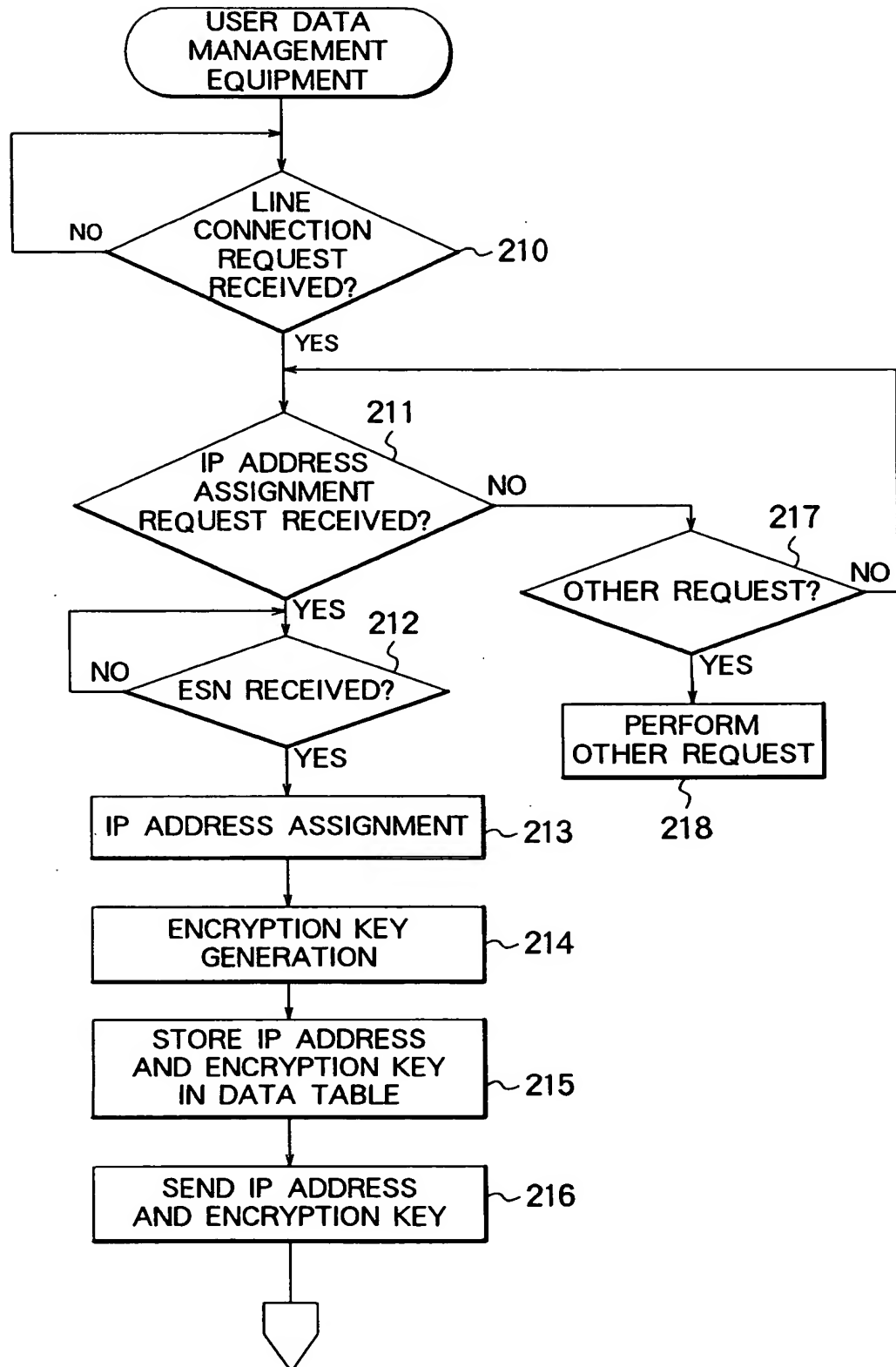


FIG. 9

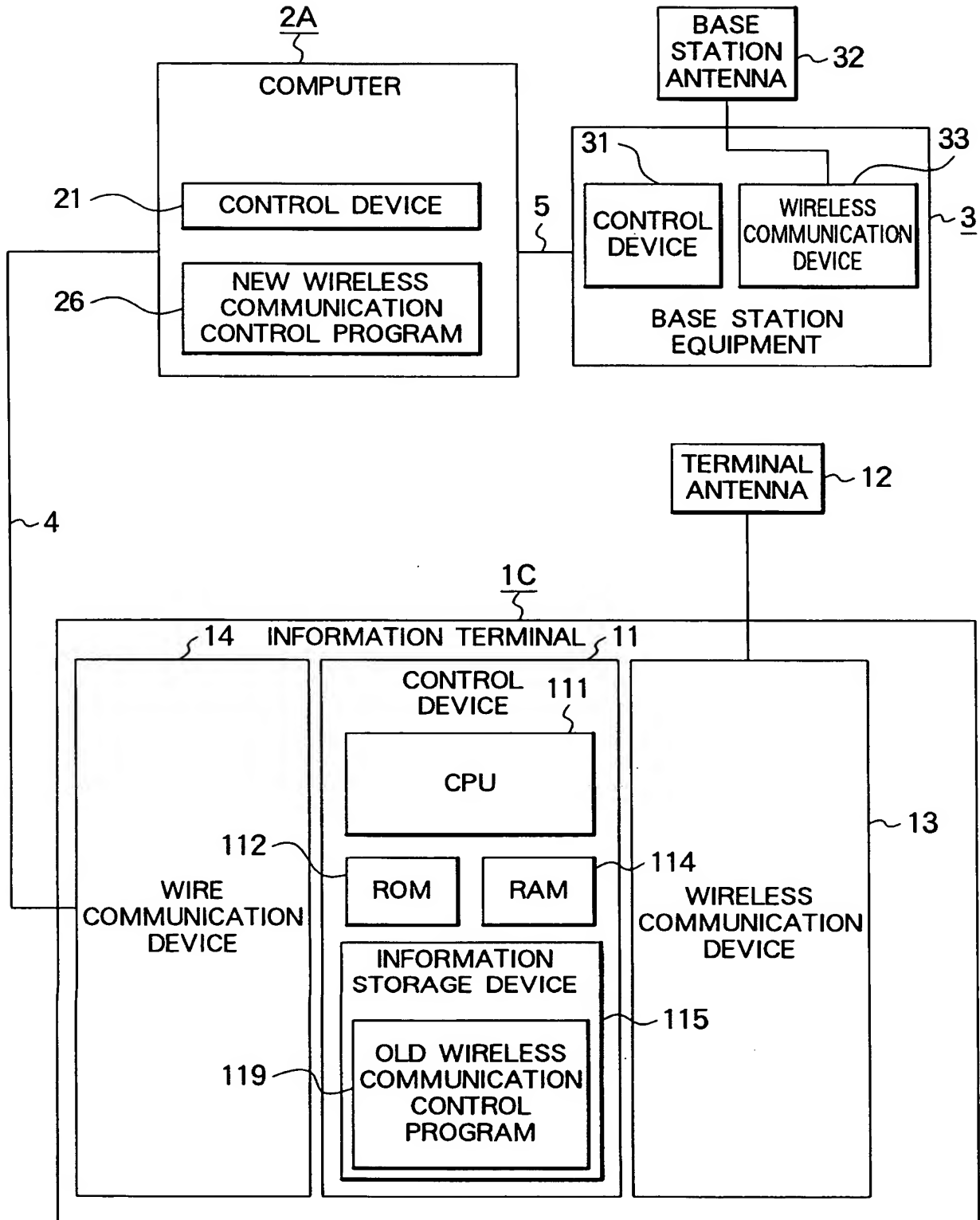


FIG. 10

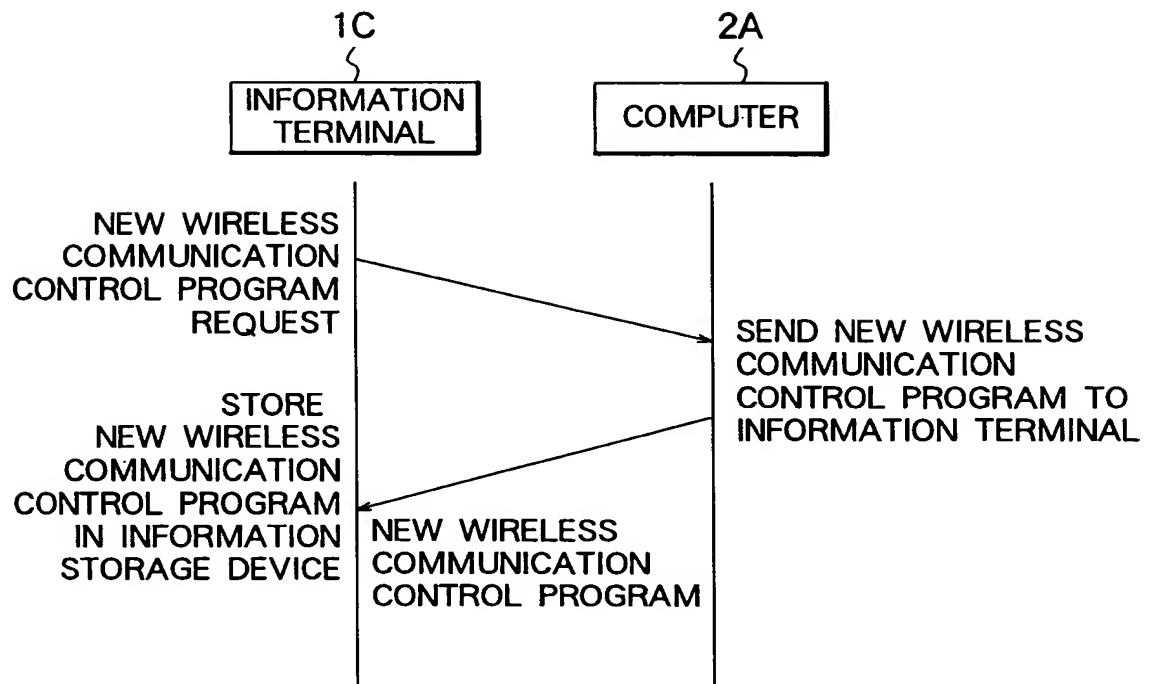


FIG. 11

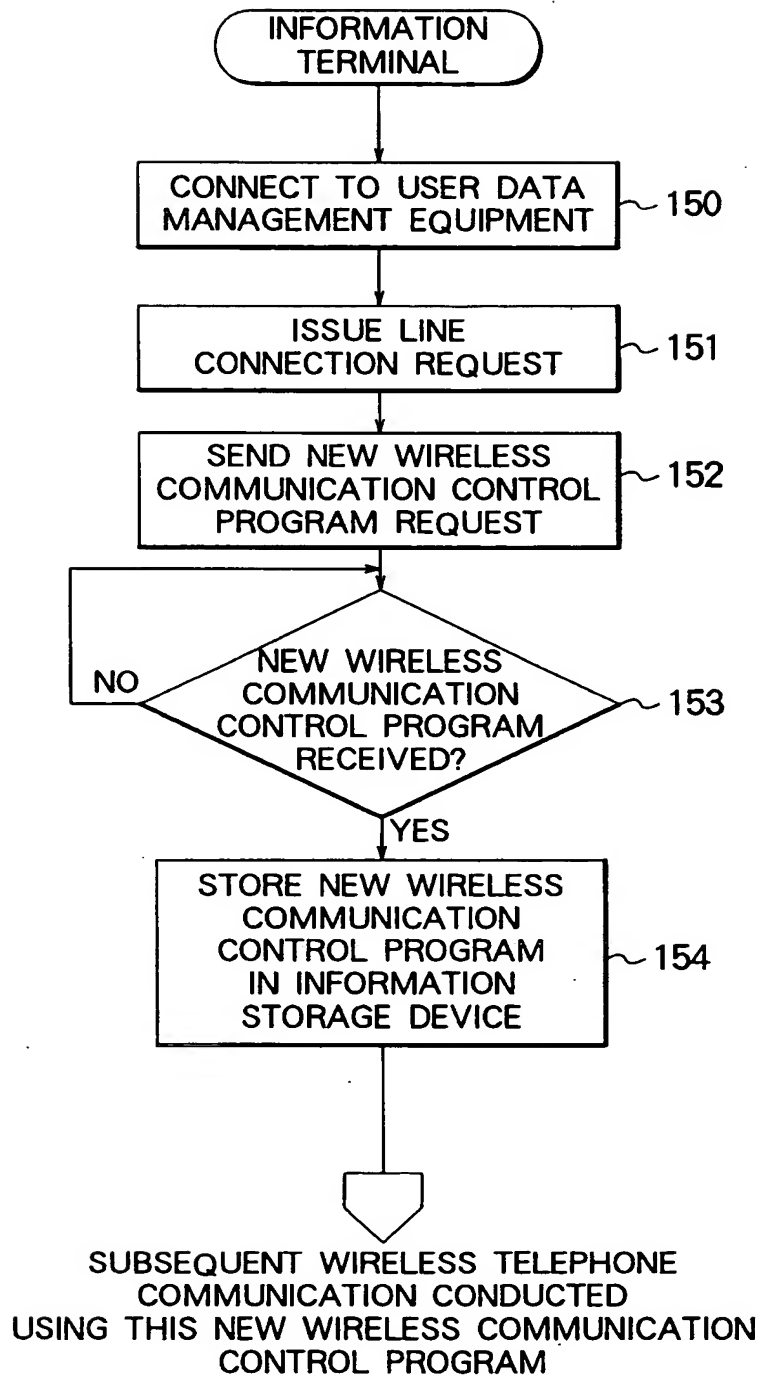


FIG. 12

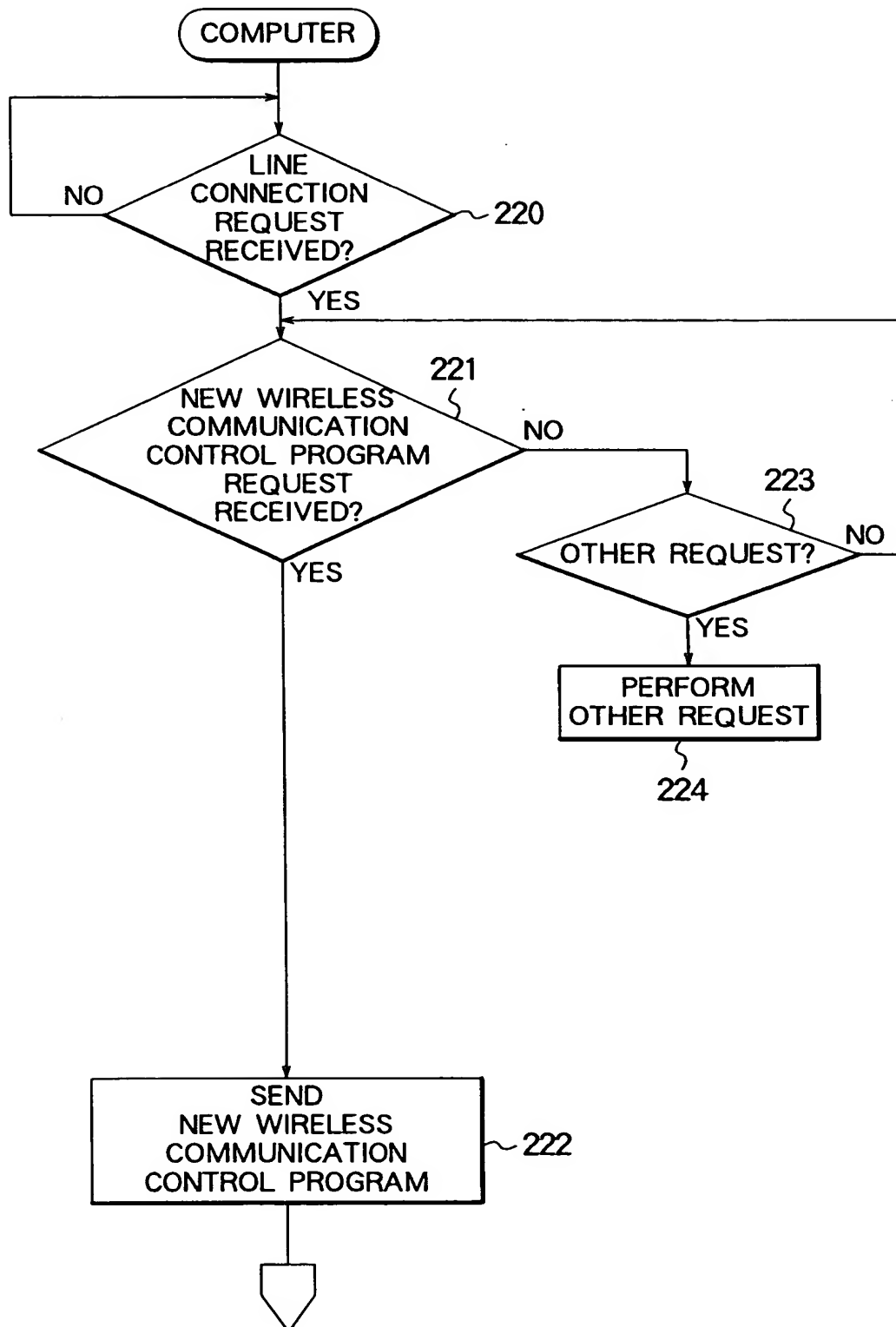


FIG. 13

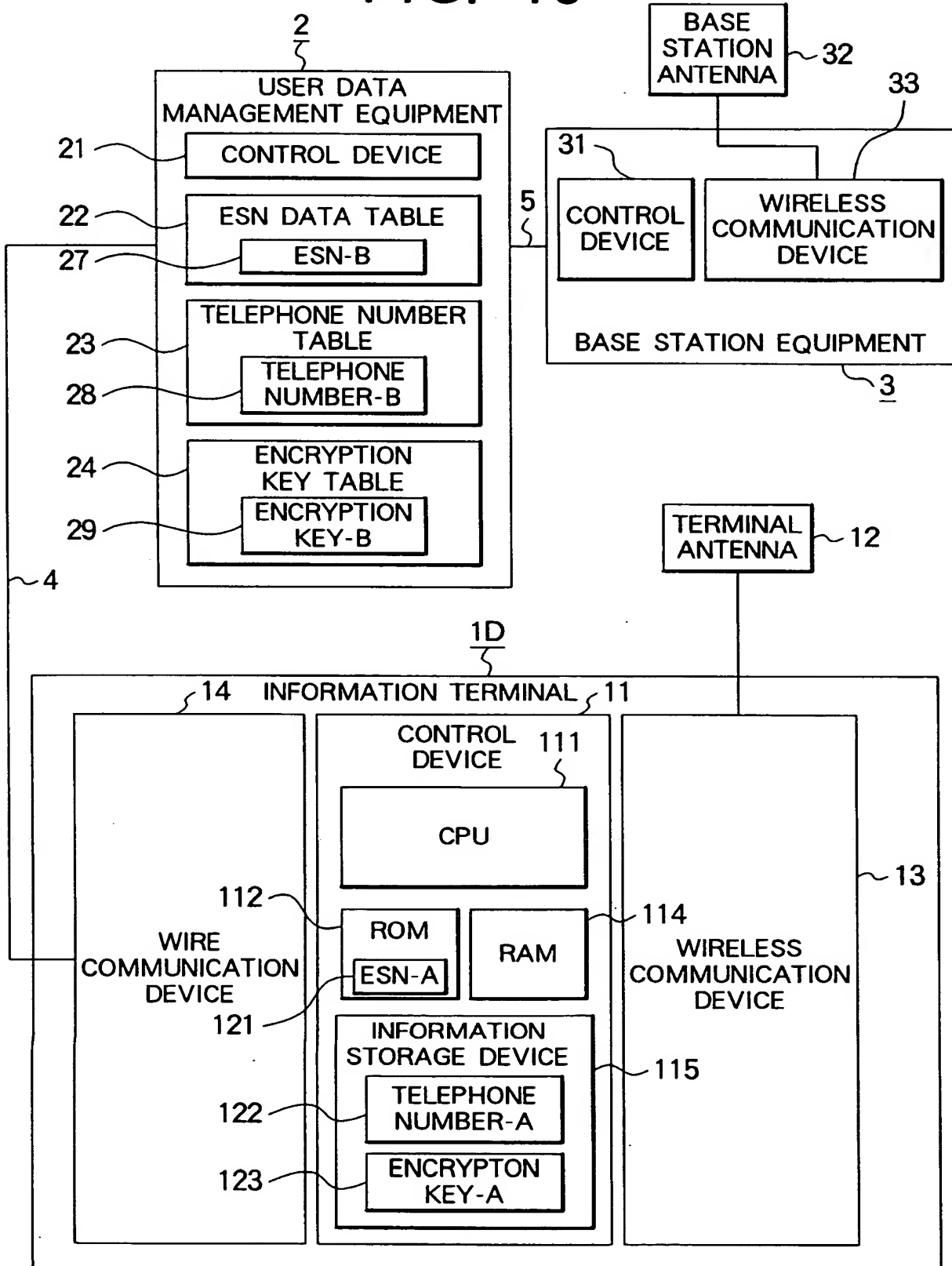


FIG. 15

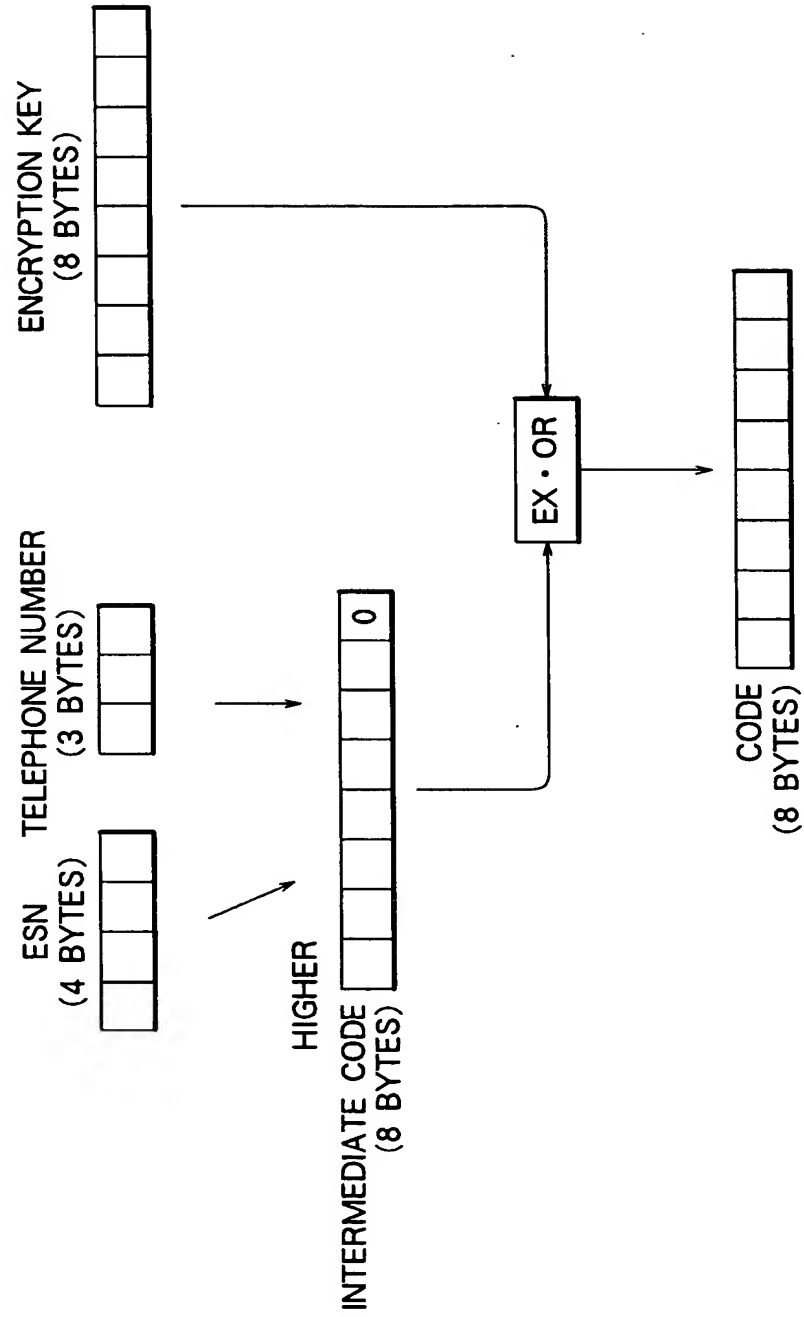


FIG. 16

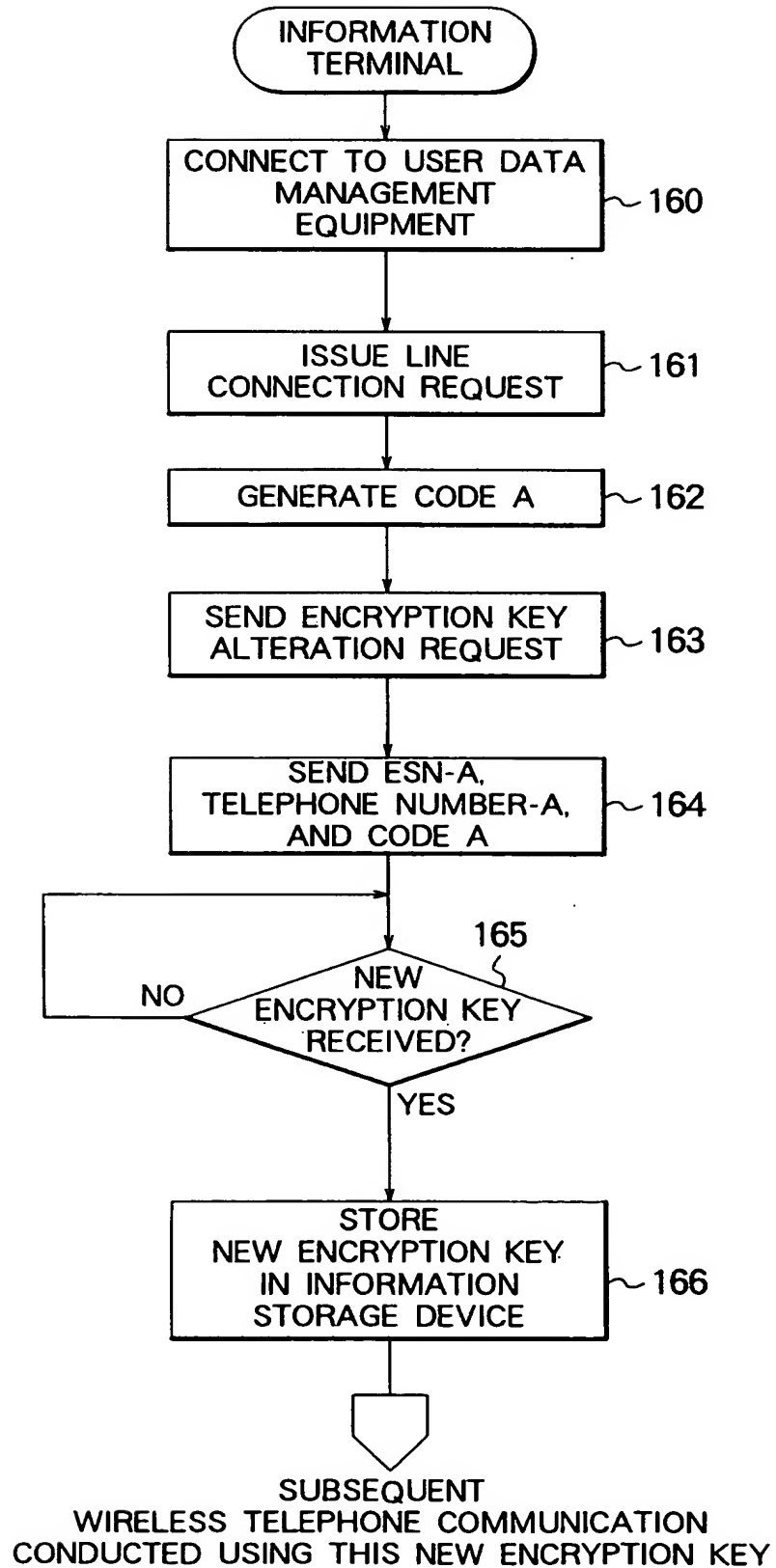


FIG. 17

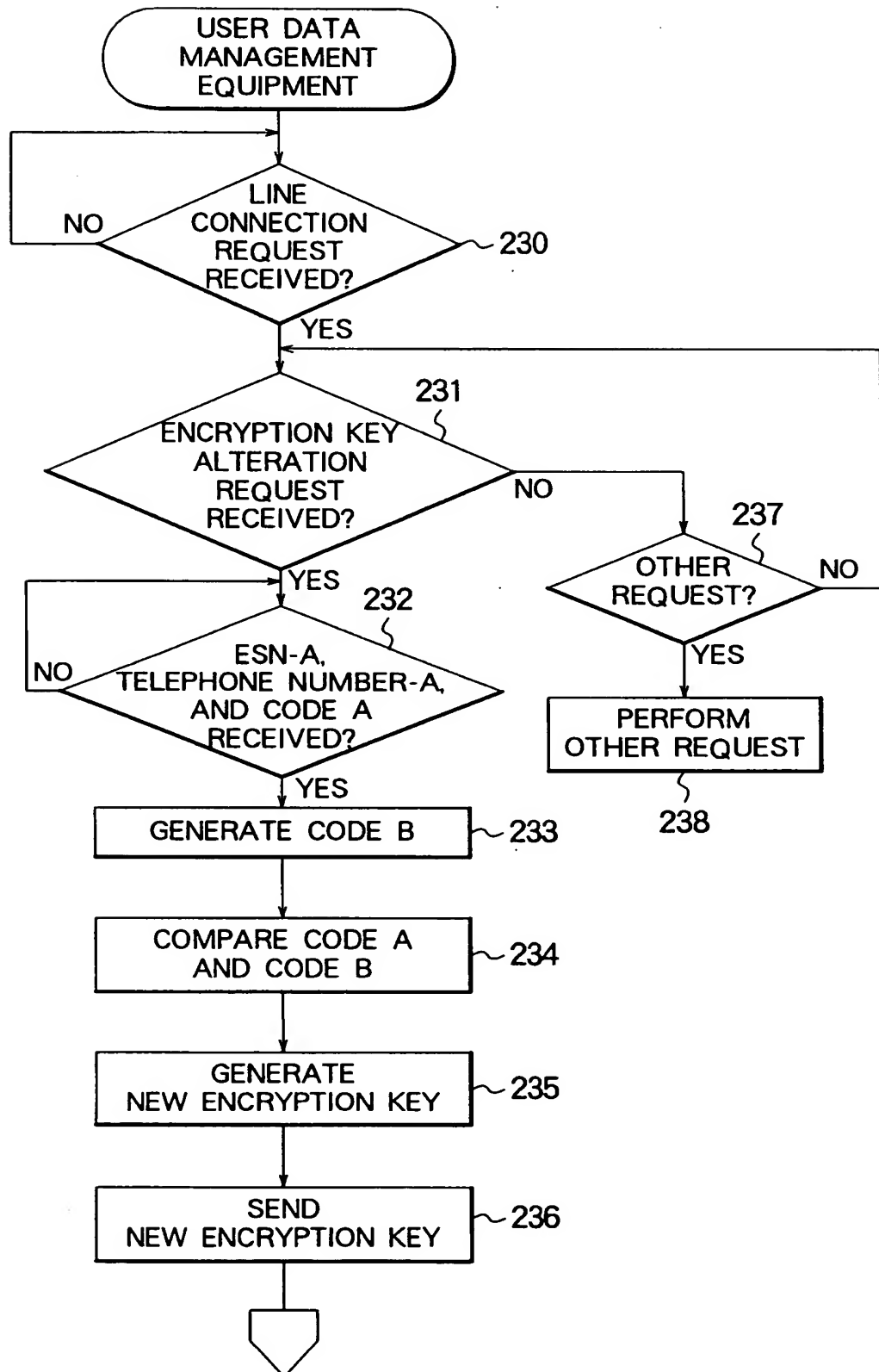


FIG. 18

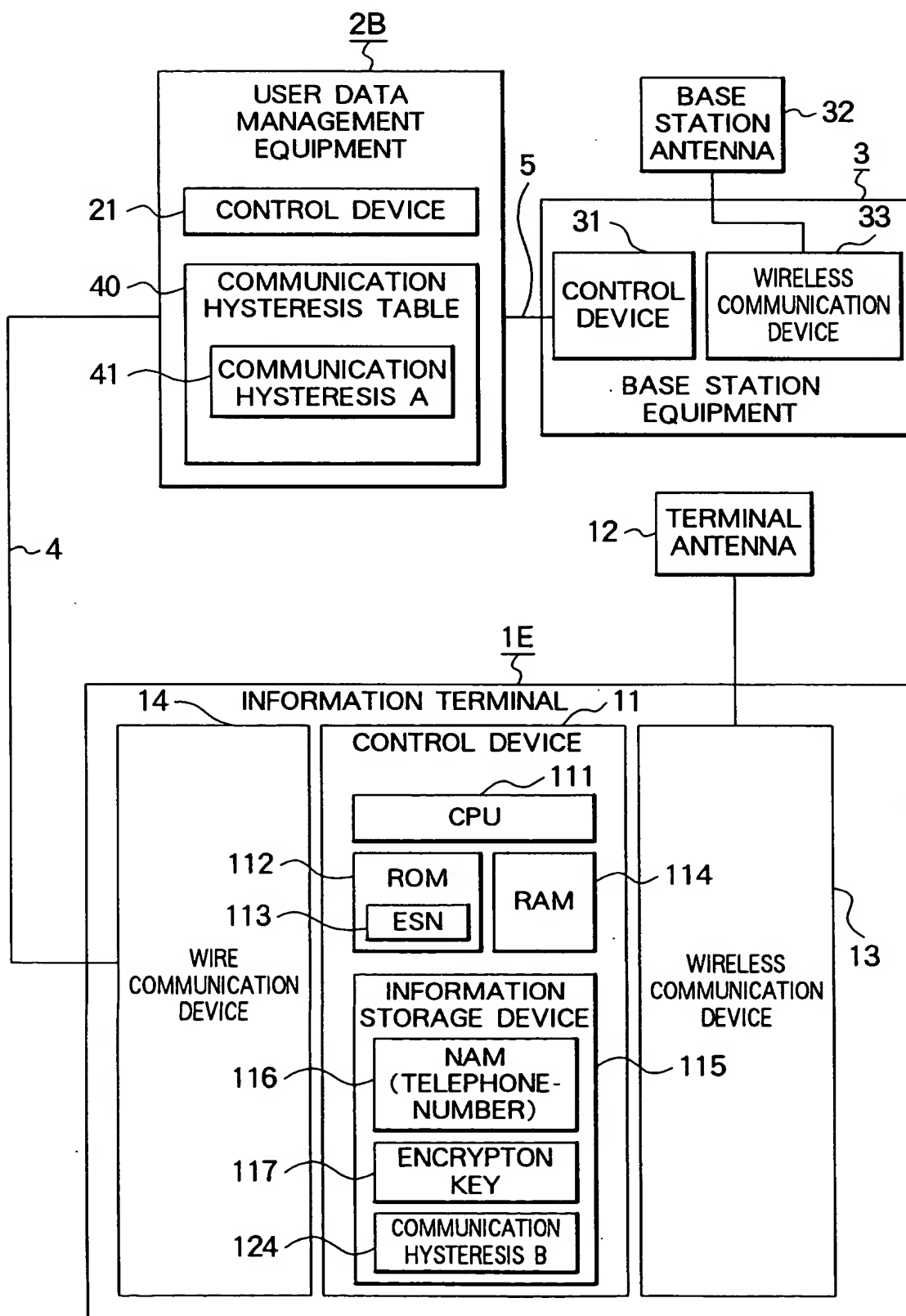


FIG. 19

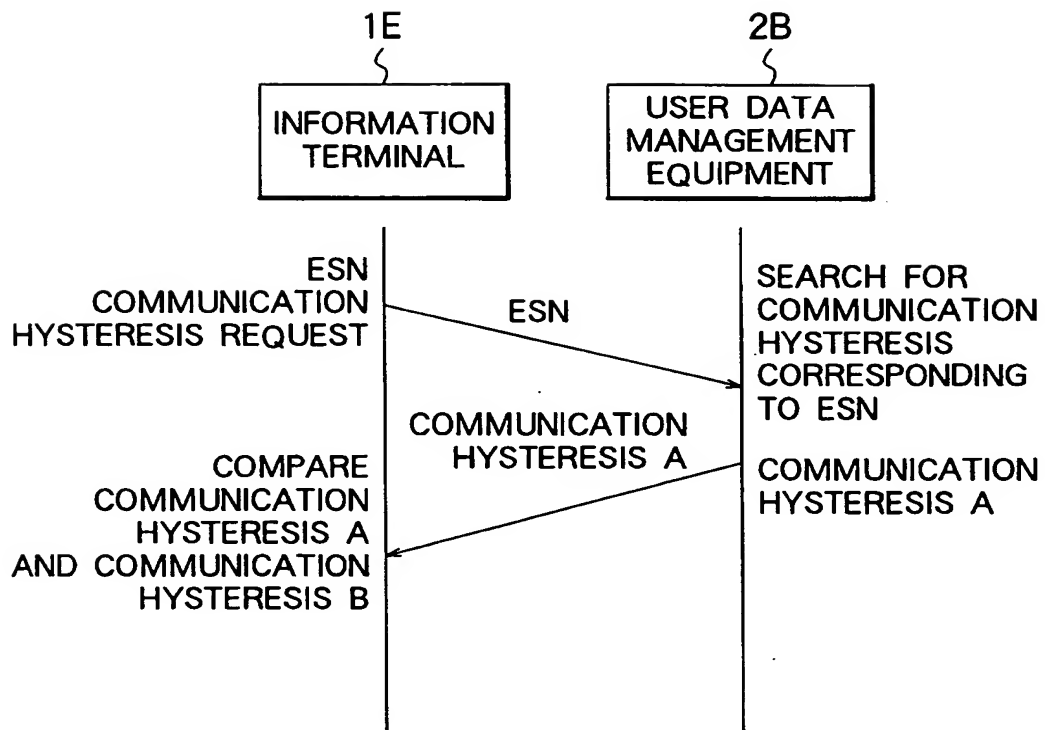


FIG. 20

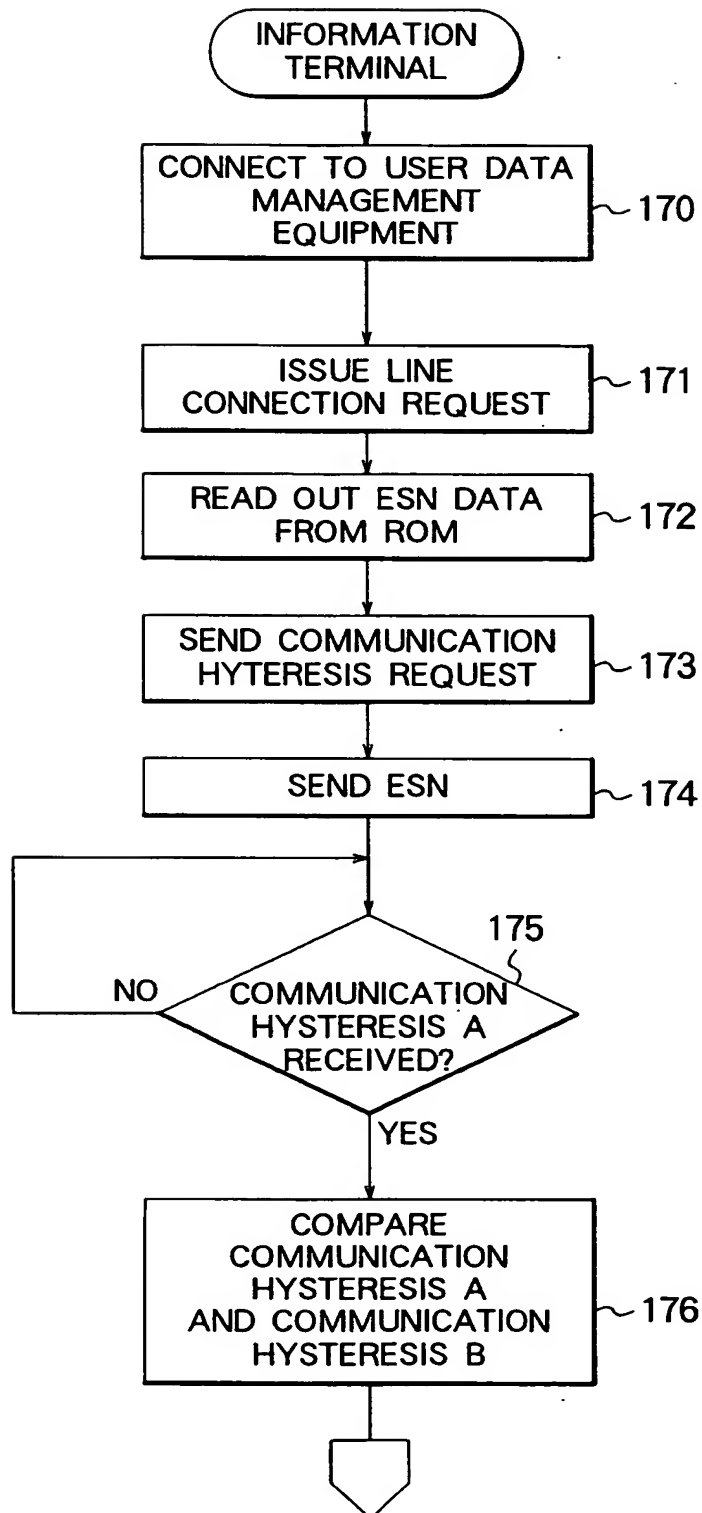


FIG. 21

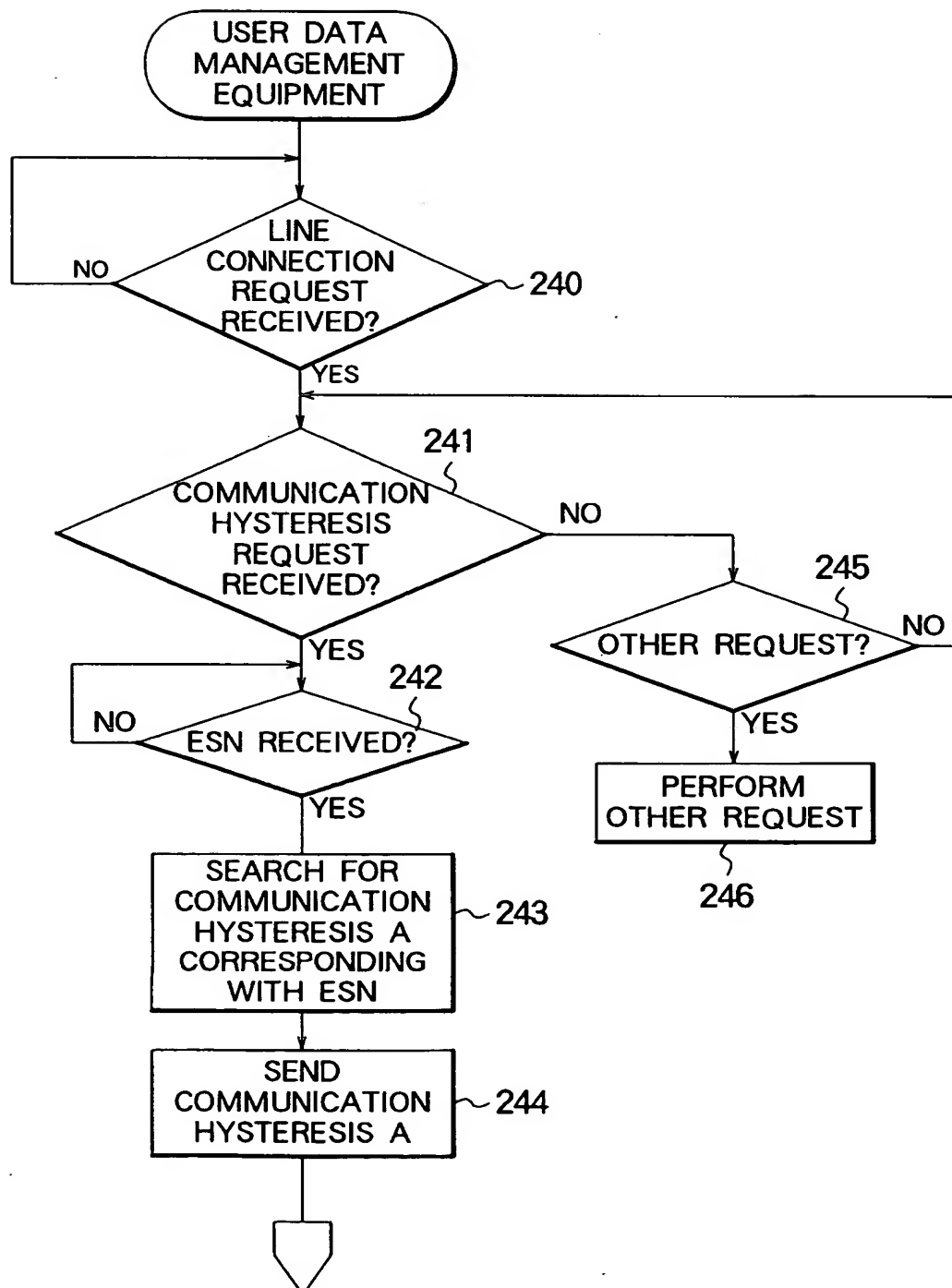


FIG. 22

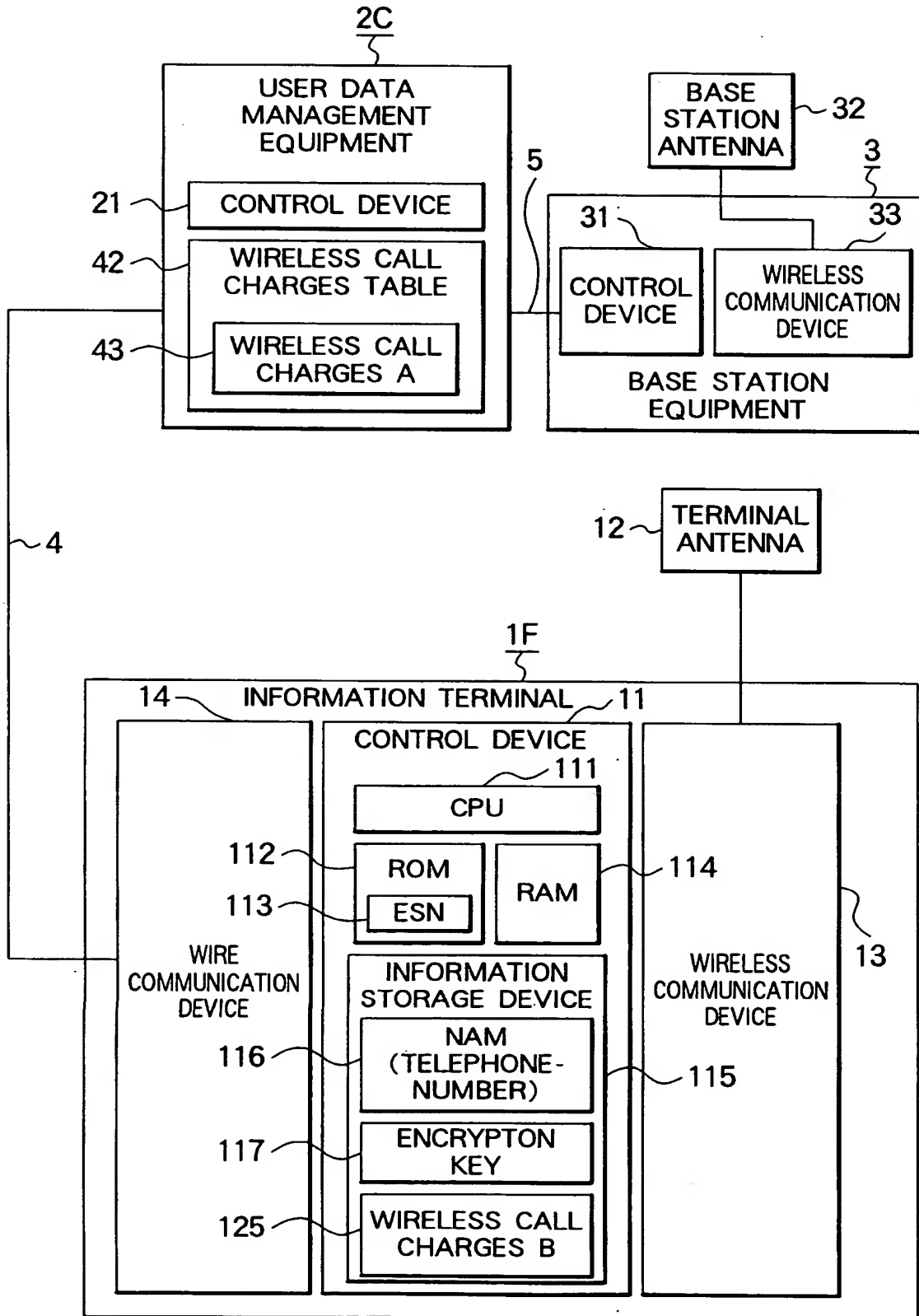


FIG. 23

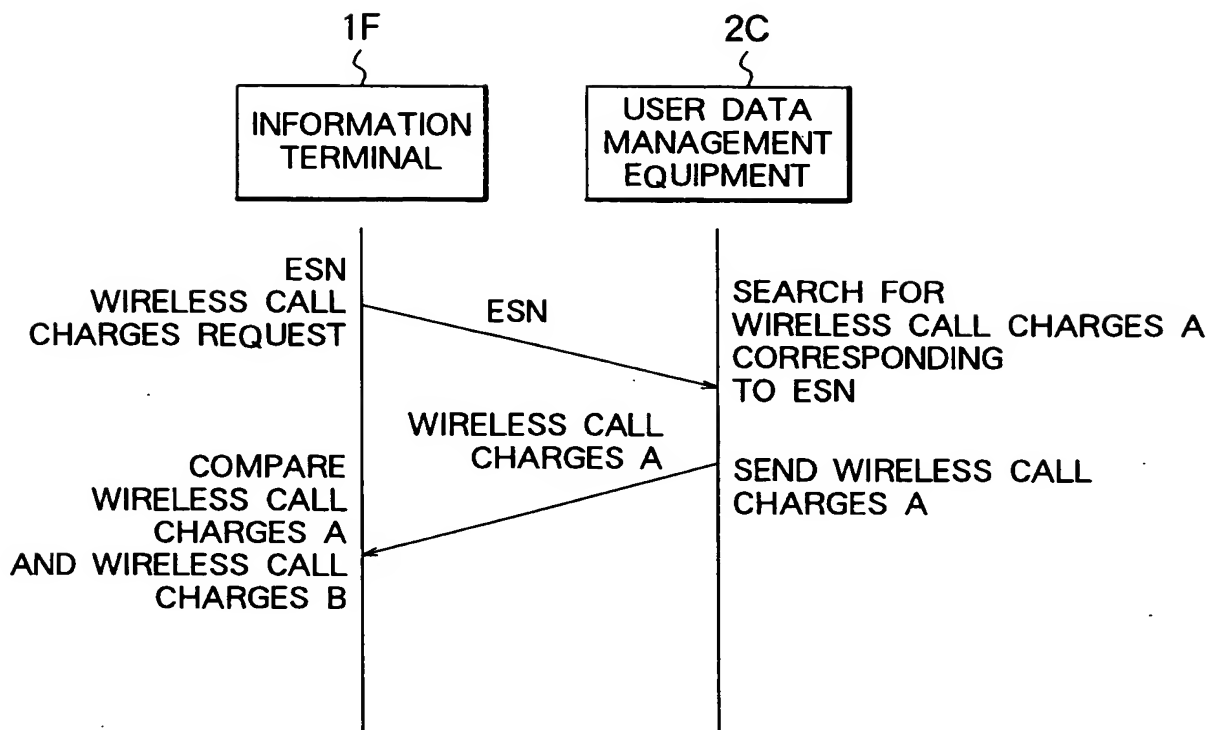


FIG. 24

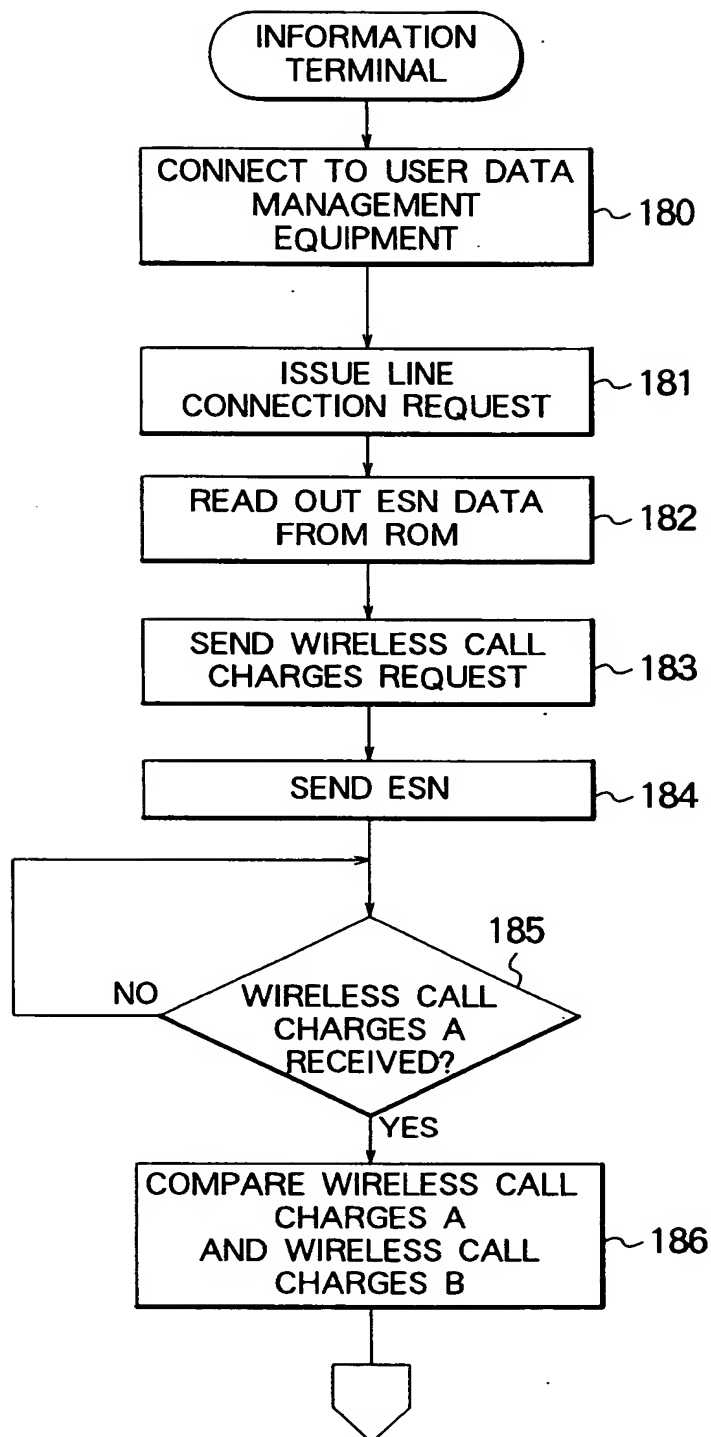


FIG. 25

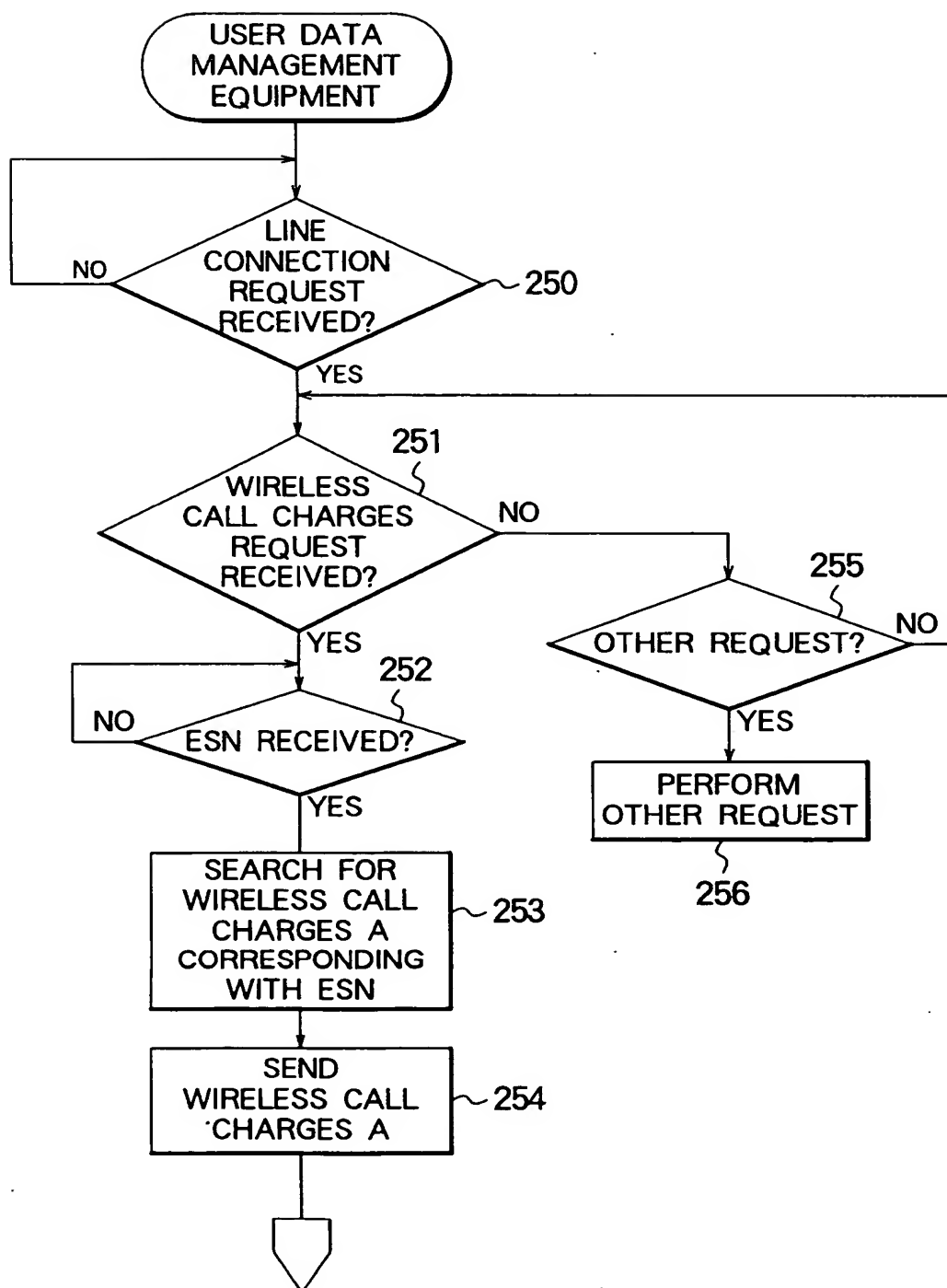


FIG. 26

